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NAUTILUS

A MONTHLY JOURNAL
DEVOTED TO THE INTERESTS OF
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THE NAUTILUS.

VOL. XXIII.

MAY, 1909.

No. 1.

NOTES ON PLANORBIS II: P. BICARINATUS.

BY BRYANT WALKER.

PLANORBIS BICARINATUS Say. Pl. I, fig. 3.

1817. *Planorbis bicarinatus* Say, Nich. Encyc., pl. i, f. 4.

1822. *Helix angulata* Rackett, Lin. Tr. xiii, p. 42, pl. v, f. 1.

1834. *Planorbis engonatus* Conrad, N. F. W. Shells, sup. p. 8, pl. ix, f. 8.

1834.? *Planorbis antrosus* Conrad, Am. J. Sc. (1) xxv, p. 343.

1861.? *Planorbis lautus* H. Adams, Proc. Zool. Soc., Lond. 1861, p. 145.

This common and well-known species is one of the characteristic species of the fresh-water pulmonate fauna of eastern North America. It stands quite by itself, having, with the exception of the recently described *P. eucosmius* Bartsch from North Carolina, no closely related species in our fauna. It is the type of the subgenus *Helisoma* Swainson.

The shape of the shell is so well marked and distinctive that the synonymy is, as shown above, comparatively small. The *Helix angulata* of Rackett was, in all probability, described in entire ignorance of Say's previous description.

The type of Conrad's *P. engonatus* seems to have disappeared. According to Haldeman, who saw the "single original specimen," then in the collection of a Mr. Mason, it was a monstrosity. Conrad's figures are poor, but Haldeman's (Mon., pl. i, figs. 5 and 6), which are apparently excellent, confirm his opinion. It was found

at Albany, N. Y. Jay (Catalogue, 4th Ed., 1852, 10267) lists *P. bicarinatus* var. *engonatus* from Georgia. Through the courtesy of Mr. L. P. Gratacap, of the American Museum of Natural History, I have been able to examine these shells. Of the eight specimens in the set, one is a *P. campanulatus* Say, nearly but not quite mature; the remainder do not differ from the usual form of *bicarinatus*, except that the mature ones have a more or less expanded lip, and might well be referred to the form described by Haldeman as var. *angistomus*. None of them exhibit the peculiar flattening of the body whorl characteristic of *engonatus*. It seems probable that these specimens were referred to Conrad's species on account of the campanulate aperture.

What the *P. lautus* of H. Adams really is, is a matter of conjecture, which can be only definitely settled by reference to the type, if it is still in existence. In the meantime Tryon's supposition that it was a young specimen of his species seems probable enough to warrant its reference to *bicarinatus*, and thus eliminate it from the list of unknown American species.

Conrad's *P. antrosus* is no doubt a form of Say's species, and is quite probably the campanulate variety described by Haldeman as var. *angistomus*, under which it will be further discussed.

Say does not give the locality of the typical form in connection with his original description, but in describing the next species, *P. parvus*, mentions that both inhabited the Delaware, so that there is practically no doubt but that the types came from that river. The Delaware River form (pl. I, fig. 3) is the common manifestation of the species as it is usually found throughout the United States. Say's description, though brief, is excellent, and leaves little to be desired. An apparent typographical error occurs in the reprint from the 3d Ed. of Nicholson's Encyc., and probably in the original, as it is followed by Binney in his edition of Say's writings. The description as printed reads: "Shell subcarinate above, and beneath translucent." If the comma was placed after "beneath" instead of after "above," the sentence would be in better accord with the facts and in all probability with the intention of the author.

The name adopted by Say in his new species is almost a misnomer, as the typical form is really not carinated at all, either above or beneath. In both places it is rather a more or less acute angulation, and is never raised into a carina as, for instance, in *Valvata tricarinata* Say.

It is to be noted that Say, with his usual nice observation, describes the minute, revolving lines which are still characteristic of the Delaware River form, and which are not uncommon in specimens from other localities. In many instances, however, they are entirely lacking. Say described his species as sinistral. Without going into the question as to whether the shell is really sinistral or ultra-dextral, it may be said that with the exception of Say's original figures, and those of Call (Rep. Dept. Geol. Ind., 1899, p. 411, pl. viii, fig. 10), all the published illustrations known to the writer treat it as dextral, and in accordance with this practically universal custom the figures for the present paper have been drawn in that position. Those who prefer to consider the shell as sinistral have only to reverse the plate.

Considering the enormous extent of territory which it inhabits, and the diverse conditions of local environment to which it is subjected in different parts of its range, *P. bicarinatus* is, for a freshwater pulmonate, remarkably uniform in its development, and comparatively few varietal forms have been described, and most of these have been distinguished within the last few years. Taking them in the order of their appearance, they are as follows:

I. Var. *UNICARINATUS* Hald., pl. I, figs. 6, 7 and 8.

Planorbis bicarinatus v. *unicarinatus* Haldeman, Monograph, p. 7 (1844).

"Whorls of the right (upper) side rounded; the carina on the left side revolves closely, so as to form a very narrow umbilicus, and the aperture is much extended towards the left." (Haldeman.)

Haldeman did not figure this form, but fortunately his type has been preserved in the collection of the Philadelphia Academy, and the figures here given have been drawn from it. It is very doubtful whether this form is entitled to varietal rank in the proper acceptance of the term. It will be observed from the figure that the inner whorls on the upper side are distinctly angulated, and that the angle does not wholly disappear until just before the aperture is reached. Such specimens are not uncommon in almost any large series, and all gradations from the bicarinate to the unicarinate form can be found in the same colony. It would seem, therefore, to be an individual rather than a racial characteristic. The form, however, is of interest as exhibiting the first step toward the purely ecarinate form described by Pilsbry as var. *aroostookensis*. The type came from the Schuylkill River.

II. Var. *ANGISTOMUS* Hald., pl. I, figs. 4 and 5.

Planorbis bicarinatus var. *angistoma* Haldeman, Mon., p. 7 (1844).

"Shell small, aperture campanulate, with the throat narrowed." (Haldeman.)

Haldeman did not figure this "variety," and his brief diagnosis copied above gives neither the dimensions of his type nor the locality from which it came. The type is not to be found in the collection of the Philadelphia Academy, and is apparently lost.

The claims of this form for varietal recognition are but little, if any, stronger than those of var. *unicarinatus*. In nearly all mature shells of *bicarinatus* there is a tendency, more or less developed, for the lip to become everted, and there is no difficulty in selecting a series showing all degrees of variation in this particular from the same locality. It is only occasionally that all the specimens in the colony are affected at the same time and to approximately the same degree. But sometimes this feature is very persistent; thus in the set from which the figure was selected not only are all the specimens (38) decidedly campanulate, but all previous lips were also campanulate, many of the specimens having two and some even three, the result being that the outline of the shell is in several instances greatly distorted. All the specimens from this locality were unusually flat, being very wide in proportion to their height. Similar specimens in all respects were collected in Bawbeese Lake, Hillsdale Co., Michigan, one of which, having a diameter of 16.5 mm., is only 4 mm. in height immediately in front of the aperture, the latter being 8 mm. in height. Some of these also are greatly distorted, showing apparently the effects of an unfavorable environment. Shells from Pine Island Lake, Kent Co., and Four Mile Lake, Chelsea, Mich., are somewhat similar, but the peculiar form is less strongly developed.

In many cases, no doubt, the sudden expansion of the lip is to be accounted for by unusually favorable food conditions at the time when the animal had really completed its normal growth; the consequent suddenly-acquired corpulency of the animal necessitating a special, rapid and expansive growth of the shell to accommodate its increased size. This seems to have been the case with the colony from which Figure 1 was taken. Up to maturity the shell was a typical *aroostookensis*, when suddenly the enormously expanded lip was developed. In this case, too, the whole colony was apparently

affected, at least the ten specimens which are now in my possession were all more or less, and that, too, without regard to size.

It seems quite probable that Conrad's *P. antrosus* from Randon's Creek, near Claiborne, Ala., is identical with this form. If so, and the form is worthy of varietal recognition, it would have priority over Haldeman's name.

Conrad never figured his species, and unfortunately gave no dimensions in his description. His specimens seem to have disappeared, and according to Tryon, in 1870, Conrad himself had forgotten all about it.

It is possible, however, that some of the original lot found their way to Europe, as the species was catalogued by Beck in 1837 as being in the collection of Prince Christian Frederick (Index Moll., p. 118, 1837). Whether these specimens are still in existence I do not know.

III. Var. *CORRUGATUS* Currier, pl. I, fig. 10.

Planorbis bicarinatus var. *corrugata* Currier, List of the Shell-bearing Mollusca of Michigan, p. 8, 1868.

This form was never described by Currier, who simply gives the locality as Perch Lake, Kent Co., Mich.

The figure is drawn from an authentic specimen (No. 3993, Coll. Walker), received from the late Dr. De Camp, who, in his Michigan Catalogue, described and figured several of Currier's species, but unfortunately neglected this one.

I have never seen but the single specimen from this locality, and do not know whether any more like it were found or not.

The form is peculiar in the strong, transverse plications, which extend entirely around the whorl, and are scarcely interrupted by the well-developed, superior and basal carinations; towards the aperture, however, they become less distinct. The revolving, incised lines are also deeply cut, and in this feature the form is similar to the var. *striatus* of Baker. It is altogether the most heavily sculptured form that I have seen. The specimen figured is rather small, measuring 9 mm. in diameter and 5 in height. The body whorl immediately in front of the aperture is 3 mm. in height. Individual specimens of var. *striatus* Baker from Long Lake, Grand Traverse Co.; Dead River, Ives' Lake, Mountain Lake, Little Lake and Howe Lake, Marquette Co.; Orchard Lake, Oakland Co., and Mud Lake, Montcalm Co., Michigan, and Gelot's Lake, New Sweden,

Me., exhibit a greater or less tendency to develop the transverse plications of this form, but none of them with anything like the strength or regularity of the specimen figured.

Similar specimens occur in the marl deposits at Bad Axe and other localities in Tuscola Co., Mich.

It is doubtful whether this form is entitled to rank as a variety. It is evidently an extreme development of the var. *striatus*, in which the transverse plication has been added to the revolving sculpture. If the name had not already appeared in the literature without description, and required explanation, I should hesitate to describe it as varietally distinct from *striatus*.

IV. Var. *PERCARINATUS* n. n., pl. I, fig. 12.

Planorbis bicarinatus major Walker, NAUT. VI, p. 136 (1893); *non* var. *major* of various species of various authors.

Shell very large for the species, thick and solid, dark horn-color tinged with purple; superior and basal carinæ elevated into a distinct keel, which is white; lip thickened, edged with brown, behind which externally is a broad, yellowish-white band, within banded by deep reddish-brown; lines of growth distinct, stronger and "puckered" around the carinæ; revolving lines very faint, not discernible except with a lens; aperture more or less expanded, sometimes distinctly campanulate, auriculate and distinctly modified by the extension of the carinæ to the lip.

The specimen figured measures 18.5 mm. in diameter and 10 mm. in height; height of body whorl in front of aperture 7.25 mm.; height of aperture 10.5 mm. A larger specimen, with a campanulate aperture, measures 19.75 mm. in diameter and 10.5 mm. in height.

Types (Nos. 3419 and 20074, Coll. Walker) from Crystal Lake, Benzie Co., Mich. Also from Pine Lake, Charlevoix Co., Mich. (Walker), and Rideau and Ottawa Rivers; Sparrow Lake, Simcoe Dist., Ontario, and Detroit Lake, Minn. (Pils.).

The original specimens, collected by the late Dr. M. L. Leach, were all dead shells, more or less bleached. The above description has been prepared from fresh specimens from the same locality collected by Dr. R. J. Kirkland, of Grand Rapids. Not in deference, for I think the rule an absurd one, but under the compulsion of the "International Code," I am forced to change the name of this very distinct variety and add another unnecessary synonym to the burden of systematic conchology.

V. Var. AROOSTOOKENSIS Pilsbry, pl. I, figs. 1 and 2.

Planorbis bicarinatus aroostookensis Pilsbry, NAUT. VIII, p. 115, 1875.

Shell having the spire and umbilicus very deep, the latter funnel-shaped, as in typical *bicarinatus*, but both upper and lower keels entirely obsolete or rounded off on the last whorl, which has the aspect of *P. trivolvis*. Surface minutely striated spirally, as in *P. bicarinatus*. Aperture less angular and less produced below than in *bicarinatus*, in consequence of the rounding of the whorls. Diameter 15 mm., alt. at aperture 7.5 mm. (Pilsbry).

Type locality, East Branch of Salmon Brook, Woodland, Aroostook Co., Maine (Pils.). Also Collins' Pond, Caribou River, Caribou, Aroostook Co., Me.; Charlevoix; Perch Lake, Kent Co.; Bessemer, Gogebec Co.; Fallams, Menominee Co., and Ispeming, Mich. (Walker).

Figure 2 represents the typical form of this variety, and is drawn from a topotype collected by Mr. O. O. Nylander. Figure 1 is the campanulate form, already referred to, which bears the same relation to typical *aroostookensis* that *angistomus* does to typical *bicarinatus*.

The Michigan specimens, especially those from the Upper Peninsula, are much smaller than the typical form, and in some examples there is a tendency to angulation on the whorls, but the large majority of the specimens are quite characteristic in the rounded, eecarinate form of the last whorl.

VI. Var. STRIATUS Baker.

Planorbis bicarinatus striatus Baker, NAUT. XV, p. 120 (1902); *Planorbis bicarinatus striatus* Baker, Trans. Acad. Sci., St. Louis, xvi, p. 9, pl. i, fig. 11 (1906).

In this form the microscopic, revolving sculpture commonly but not invariably present in the typical form is greatly intensified, and in the typical expression of the variety is quite conspicuous to the naked eye.

In the original description this sculpture is stated to consist of "raised spiral lines," while in the second paper quoted above it is said that "in some specimens the spiral lines are deeply incised." This incongruity is an apparent one only, and depends on whether the elevated or the depressed portions of the surface are wider or more conspicuous. Starting with the typical form, in which the revolving sculpture is either entirely wanting or very minute, it is

clear that the lines, when present, are incised. As the sculpture increases in strength, the intervals between the incised lines diminish, and when they become equal, the surface becomes typically striate and the revolving sculpture consists of incised or elevated lines, as the observer chooses to designate it.

Very rarely the surface is distinctly malleated, in which case there is a series of irregular, raised, revolving lines, which are quite different from the regular sculpture of *var. striatus*. The intensification of the spiral sculpture characteristic of this form seems to be peculiar to the northern states, as it has not been noticed from south of Mason and Dixon's Line. The most characteristic specimens come from the northern tier of states from Maine to Michigan.

The types were pleistocene fossils from Milwaukee, Wisconsin. It is a common form in Michigan, varying in size and proportion like typical *bicarinatus*. Specimens are also before me from the following localities: Square Lake; Rockville, Me.; Profile Lake, N. H.; Cedar Lake, N. Y.; Port Oram, N. J.; Gore's Bay, Manitowish, Id., Lake Huron, Algoma; Georgian Bay, Ontario.

VII. *Var. PORTAGENSIS* Baker, pl. I, fig. 9.

Planorbis bicarinatus portagensis Baker, NAUT. XXII, p. 45 (1908).

This recently described and very striking form is characterized by its closely coiled whorls, deeply funicular upper and lower surfaces and acute carination; the umbilicus is comparatively narrow and deeply excavated; the aperture is large, auriculate, higher than wide, and acutely angled above and before; the lip is sharp and but slightly expanded.

Type locality, Portage Lake, Aroostook Co., Maine. Also Square Lake, Cross Lake and Second Lake, Aroostook Co., Me. (Walker); Meaches Lake, Hull, Quebec (Pils.).

The figure is drawn from a cotype kindly furnished by Mr. F. C. Baker. Specimens from Carp Lake, Emmet Co., and Betsey Lake, Benzie Co., Michigan, though not typical, may fairly be referred to this form. Immature examples, especially those from Betsey Lake, are almost identical with the immature Maine specimens, the whorls, perhaps, being more regularly rounded and lacking the decided flattening towards the base of the typical form. But the mature shells, though retaining the sharp carination above and below, are more inflated, and the aperture is wider and does not extend so far above and below the body whorl as in the typical form, being in shape and

position more like that of var. *percarinatus* (fig. 12). Two additional specimens from the original locality, submitted by Mr. Nylander, agree very exactly with the Michigan form.

Mr. Nylander writes in regard to the habits of this form: "I think the variety *portagensis* lives in comparatively deep water, say 25 feet or so as only a few good specimens have been collected and these have always been "dead" shells. The specimens from Cross Lake were dredged in 25 feet of water.

This raises a question as to whether the inflated form of this variety is not correlated with its habitat in deep water as suggested by Pilsbry in regard to the *Physa* and *Planorbis* from Lake Patzcuaro, Mexico (Proc. P. A. N. S., 1891, p. 324).

A parallel case is found in *Lymnæa mighelsi* W. G. Binn, which in Michigan, at least, lives in deep water a large part of the year (See NAUT., XIV, p. 8). In fifteen years' collecting at Pine Lake, Marquette Co., Mich., I have found this species only twice in shallow water and then in considerable numbers, but only for a few days. It seems likely that the peculiar form of *Physa lordi* Bd. is to be accounted for in the same way as in Michigan; at least, it is found only in the larger inland lakes. *Planorbis multivolvis* Case is also apparently a deep-water species (NAUT., XXI, p. 61).

VIII. Var. ROYALENSIS n. v., pl. I, fig. 11.

Shell thin, light greenish horn-color; superior carination prominent, rounded, not acute; basal carina very strong, not acute, but forming a heavy, rounded cord around the deep, funicular umbilicus; upper surface concave, but more or less flattened and not as deep as the umbilicus; sides flattened and narrowed towards the base and contracted just above the basal carina; lines of growth strong and distinct, the sides being longitudinally coarsely and irregularly striated; revolving sculpture strong and distinct; aperture triangular, the upper side very nearly straight and almost flat, meeting the lip at nearly a right angle; acutely angled below; lip thin, sharp, not expanded. Alt. 10, diam. 15; height of body whorl in front of aperture 5 mm.

Types (No. 29163, Coll. Walker) from Siskowit Lake, Isle Royale, Lake Superior, Michigan. Cotypes in the collection of the Philadelphia Academy.

About twenty specimens of this strongly characterized form were

collected by the University of Michigan expedition in 1905, and are very uniform in the peculiar features above described. *P. bicarinatus* was collected in 1904 and 1905 in a number of different localities in various parts of the island, but all such were quite typical in form.

The longitudinal sculpture of this form is unusually strong for the species, and reminds one of the heavy sculpture of *P. corpulentus* Say, but differs in being less regular and lacking the acute ridges of that species. *Royalensis* is nearer to *portagensis* than to any other form of *bicarinatus*, but differs in being wider and in the development and position of the superior carina, wider umbilicus, stronger basal carina and shape of the aperture.

(To be continued.)

RECENT FRESH-WATER FOSSILS FROM BRONX BOROUGH,
NEW YORK CITY.

BY EDWIN W. HUMPHREYS.

The shells here mentioned were found at what is now 171 St. and Morris Ave., Borough of the Bronx, New York City. The swamp which is situated at this point lies in a long, narrow, anticlinal valley which has been eroded in the Inwood Limestone. When the street, now known as Morris Ave., was filled in across the swamp, the peaty deposit, which had accumulated here, was forced up to heights of several feet on either side of it. This caused the peat to crack in all directions and revealed numerous pockets which were full of small shells. The shells were extremely abundant; so thickly were they heaped together that they could easily be scooped up with a garden trowel. From the manner in which they were found it would seem as if they had been gathered together by currents or eddies in the waters of the swamp. All of the shells were bleached to a chalky whiteness and were very fragile. The following species were found.

Amnicola limosa (Say) Hald. Shells of this species, though common, were not very abundant and were usually more or less injured.

Valvata tricarinata Say. These were exceedingly numerous, hundreds of them being heaped together in a single pocket. They were of all sizes, some being so small that they were lodged in the apertures of the larger ones. Evidently they represented individuals of all ages.

Physa heterostrophica Say. This species was rather scarce.

Planorbis bicarinatus Say. This form was also uncommon.

Planorbis parvus Say. These varied in size as much as did the shells of *Valvata tricarinata* Say, and were about as abundant.

Pisidium variable Prime. This species was very rare. Usually the valves were separated, only occasionally were they found united.

Whether or not these forms still inhabit this place I am not prepared to say. Though I have not been able to find any living individuals, further search may yet reveal them.

I desire to acknowledge the assistance of Mr. L. P. Gratacap and Mr. Bryant Walker in the identification of some of the species.

UNIONIDÆ FROM AN INDIAN GARBAGE HEAP.

BY DR. A. E. ORTMANN, CARNEGIE MUSEUM, PITTSBURGH, PA.

On the western banks of the Monongahela River in southwestern Pennsylvania, upon the flood plain at the Point Marion Ferry, in Greene Co., opposite the point where the Monongahela and Cheat rivers unite, the writer found on July 9, 1908, a heap of *Unionidæ* shells, buried about one to two feet in the soil on the side of a road. The soil consists of the characteristic river-silt of this region. Since Indian "relics" have frequently been found at this place, in fact, since it is known as the site of an old Indian settlement, it seems beyond question that this pile (about 2 feet high) represents an old Indian garbage heap of shells which had been used for food.

When first found, the shells were rather brittle and soft, and many of them crumbled to pieces. But enough were secured, which remained whole, and subsequently they have hardened. They look like fossil shells in so far as in most of them the epidermis, and with it the color, is gone (only in a few *Quadrulas* fragments of the epidermis remain). In species, where the nacre originally is colored (*Unio gibbosus* and *crassidens*), the color has entirely faded away, or only very slight traces of it are discernible.

It is hard to say how long ago this pile was formed: it may be less than a hundred years old. But this does not matter. The interesting fact about it is that this shell heap has furnished a small collection of *Unionidæ*, which contributes considerably to our knowledge of the *Unionidæ*-fauna of the Monongahela River drainage.

At the present time, on account of the pollution of the water, this fauna has completely disappeared in the Monongahela proper: there

is not a single living mussel in this river from Pittsburgh to the West Virginia state line (which is within a mile and a half to the south of our locality). Only a few of the tributaries contain mussels, and the most important one is the Cheat River, in which (in Pennsylvania), a rich fauna is yet present within two miles of our locality. The writer has collected repeatedly in the Cheat, in Fayette Co., from a point about a mile above Point Marion up to Cheat Haven, close to the State line. Another locality for *Unionidæ* is about three miles to the north, in Dunkard Creek, Greene Co., where the writer also collected a number of species. It is interesting to compare these faunas with that of the Indian garbage heap at Point Marion Ferry, which either comes from the Monongahela proper, or from the Cheat.

I give first here a list of the latter.

1. *Truncilla perplexa cincinnatiensis* (Lea). 3 double, 11 isolated valves, all males of medium and small size. This is not the typical *cincinnatiensis*, but a form intermediate between this and the typical *perplexa* (Lea); the nodes upon the disc are rather small and more numerous than in the typical *perplexa*, but they are less numerous than in *cincinnatiensis*.

Tuberculate forms of *Truncilla perplexa* have never been found recently in western Pennsylvania; all specimens of *perplexa* of this region belong to the next variety.

2. *Truncilla perplexa rangiana* (Lea). 6 double, 7 isolated valves, all males of medium and small size.

Not found at present in the Monongahela drainage, but rather abundant in the Allegheny River from Armstrong County upward. Also in the Shenango River in Lawrence County; the nearest localities at present are about 80 to 100 miles away from Point Marion.

3. *Lampsilis ventricosa* (Bar.). Fragment of one left valve; young specimen.

At present near Point Marion, both in the Cheat River and Dunkard Creek. Widely distributed in western Pennsylvania.

4. *Lampsilis ventricosa ovata* (Say). Fragment of one left valve (beak portion); young specimen.

Not found at present in the Monongahela drainage. It used to be in the Ohio in Allegheny County, and is yet found in the Ohio in Beaver County and in the Allegheny in Armstrong County and farther up.

5. *Lampsilis multiradiata* (Lea). 2 double, 1 single valve; me-

dium size. Although the characteristic color of the epidermis is gone, these specimens agree completely with this species in the shape of the shell and of the hinge teeth.

This species is found in the Cheat River and elsewhere in western Pennsylvania, preferring smaller streams.

6. *Lampsilis ligamentina* (Lam.). 4 isolated valves; one young, the others of medium size.

At present in the Cheat River, but not abundant. It is the most abundant species in the large rivers of western Pennsylvania.

7. *Obovaria circulus* (Lea). 1 left valve; small. Not typical, inclining toward *O. lens* (Lea) in shape; probably a female.

This species (including the form *lens*) is found scattered over the Ohio drainage in western Pennsylvania. From the Monongahela it is known only from a single locality at Charleroi, Washington County, about 35 miles north of Point Marion

8. *Cyprogenia irrorata* (Lea). 2 double, 4 isolated valves, of medium size.

Not in the Monongahela drainage, and altogether rare in western Pennsylvania; known from the Ohio below Pittsburg and from the Allegheny River in Allegheny and southern Armstrong County. No live specimens have been found recently.

9. *Ptychobranhus phaseolus* (Hldr.). 1 double, 3 isolated valves, of medium size.

Abundant in Cheat River; also in Dunkard Creek. Widely distributed in the Ohio drainage in western Pennsylvania, with exception of the large rivers.

10. *Unio gibbosus* Barn. 4 double, 7 single valves, medium and small size.

Abundant in Cheat River; also in Dunkard Creek. Everywhere in western Pennsylvania.

11. *Unio crassidens* Lam. 7 double, 4 single valves; one above medium size, the others medium and small.

Only in the large rivers; abundant in the Ohio and lower Allegheny. Known from the Monongahela at Charleroi, Washington County, but not farther up. No trace of it in the Cheat.

12. *Pleurobema clava* (Lam.). 2 single valves, medium size.

Present in Cheat River. A rare species in western Pennsylvania, preferring smaller streams.

13. *Quadrula subrotunda* (Lea). 1 double, 5 single valves; medium and small size.

In the Cheat River at present. Also in the Monongahela at Charleroi, Washington County, and in the Ohio and Allegheny Rivers from Beaver to Armstrong Counties. A species of the larger rivers.

We see, that of these thirteen forms one (*Truncilla perplexa cincinnatiensis*) is not present any more in western Pennsylvania, and five (*Truncilla perplexa rangiana*, *Lampsilis ventricosa ovata*, *Obovaria circulus*, *Cyprogenia irrorata*, *Unio crassidens*) are not found any more in the vicinity of Point Marion (in Cheat River or Dunkard Creek). Of the latter, *Lampsilis ventricosa ovata*, *Cyprogenia irrorata*, and *Unio crassidens*, are typical inhabitants of the large rivers, and, near Point Marion, possibly once existed only in the Monongahela River, the fauna of which is now destroyed. *Truncilla perplexa* and *Obovaria circulus* may yet turn up in the Cheat River, but, if present at all, must be very rare at the present time. This is the more remarkable, since the two forms of *Truncilla perplexa* were represented, in the garbage heap, by a comparatively great number of individuals.

The small size of all specimens shows that the Indians selected for food only such small specimens, rejecting the big ones.

The chief interest of this little collection lies in the fact that it gives us an idea of what damage has been done to our *Unionidæ-fauna* in recent times. For comparison, I submit here the lists of the species collected by myself in Cheat River and Dunkard Creek.

CHEAT RIVER (collections made on Sept. 6, 1904, Sept. 16, 1907, July 10, 1908).

- | | |
|---|---|
| 1. <i>Lampsilis ventricosa</i> (Bar.). | 8. <i>Symphynota costata</i> (Raf.). |
| 2. <i>Lampsilis multiradiata</i> (Lea). | 9. <i>Alasmidonta marginata</i> (Say). |
| 3. <i>Lampsilis ligamentina</i> (Lam.). | 10. <i>Unio gibbosus</i> (Barn.). |
| 4. <i>Lampsilis recta</i> (Lam.). | 11. <i>Pleurobema clava</i> (Lam.). |
| 5. <i>Lampsilis iris</i> (Lea). | 12. <i>Quadrula undulata</i> (Barn.). |
| 6. <i>Ptychobranchus phaseolus</i> | 13. <i>Quadrula pustulosa</i> (Lea). |
| (Hildr.). | 14. <i>Quadrula subrotunda</i> (Lea). |
| 7. <i>Strophitus undulatus</i> (Say). | 15. <i>Quadrula tuberculata</i> (Raf.). |

The leading species is *Unio gibbosus* (30 per cent.); then follow: *Lampsilis recta* (20 per cent.) and *Ptychobranchus phaseolus* (20 per cent.). The rest (12 species) makes up the remaining 30 per cent. The scarcity of *Lampsilis ligamentina* is remarkable, since this species usually is the leading species in our rivers. Probably, this locality

is near the limit of the range of this species, and the latter does not go much farther up stream. All of the species are rather small, which is most striking in *Lampsilis recta*, which actually is represented by a dwarf race.

All the species have been found alive, except *Quadrula undulata*.

DUNKARD CREEK (collections made on July 8 and 9, 1908).

- | | |
|---|---|
| 1. <i>Lampsilis ventricosa</i> (Barn.). | 8. <i>Strophitus undulatus</i> (Say). |
| 2. <i>Lampsilis luteola</i> (Lam.). | 9. <i>Anodonta grandis</i> (Say). |
| 3. <i>Lampsilis recta</i> (Lam.). | 10. <i>Symphynota costata</i> (Raf.). |
| 4. <i>Lampsilis iris</i> (Lea). | 11. <i>Unio gibbosus</i> (Barn.). |
| 5. <i>Proptera alata</i> (Say). | 12. <i>Quadrula rubiginosa</i> (Lea). |
| 6. <i>Tritogonia tuberculata</i> (Barn.). | 13. <i>Quadrula tuberculata</i> (Raf.). |
| 7. <i>Ptychobranchus phaseolus</i>
(Hildr.). | |

Of these, only *Lampsilis luteola* and *Anodonta grandis* were found alive: the condition of the creek was not favorable for collecting (first and second day after a heavy thundershower). It is probable, that the fauna is not complete, and I cannot say anything about the frequency of the single species.

VARIATION.

BY REV. HENRY W. WINKLEY.

First, nature never makes two individuals exactly alike; secondly environment. One hundred shells of the same species from a given locality will show individuality. Compared with a group of the same species from another region there is another difference. Like the difference between races of the human family, this is undoubtedly due to environment. At Eastport, Maine, where the Bay of Fundy tides create strong currents, chitons, limpets and other forms are in profusion and attain unusually large size. These may be called sedentary forms and depend on food being brought to them. A few feet away *Buccinum* is abundant but small. The same is true of *Lunatia heros* found in neighboring waters. These are carnivorous forms and are much larger at Casco Bay and its neighborhood.

Haminea solitaria is a white shell. A small colony from the

Branford River has every individual a deep brown. I wonder if this is due to the presence of a large iron foundry a short distance away. Erosion is not a characteristic, yet it does result from environment. This is conspicuous where unios are taken from waters where there is decaying vegetation. The reason is well known; acid from decaying leaves acts on the lime of the shell. The same effect may be seen in marine shells taken from waters where a river meets the sea. An interesting effect of air may be seen in the author's cabinet. Shells of *Fusus decemcostatus* taken below low tide are well preserved even to the apex; others from a few yards away, exposed to the air at low tide, are much eroded.

Pure white sets of *Gemma gemma* may be found at Woods Hole and Branford, Conn. At Provincetown they are a very dark purple, some specimens showing hardly a trace of white. At Revere Beach the type is white with perhaps a third of the shell faintly tinted purple. Reasons for this variation I cannot give. Nor can I explain why sets found a dozen years ago at Revere Beach should vary from specimens obtained at the same spot a year ago.

Litorinella minuta is abundant in pot holes in the marshes. Environment there is good for it. A dwarfed variety is found in the Branford River, and the same form occurs on dead eel grass under the wharves at Provincetown. Evidently this form flourishes better in still water. Temperature has its influence. *Planorbis trivolvis* occurs throughout New England. It is small in the Connecticut River at Springfield, the same at Branford and eastern Massachusetts. In northern Maine large, and the largest and finest set in the author's cabinet was obtained at Dalton, Mass., in the Berkshire hills. This last region is well known as having northern insects, undoubtedly the other species of shells would show affinity with the forms in northern New England. Climate alone explains this variation. The forms from the Connecticut River certainly have water enough, but they are small. Other sets are from small bodies of water; only in colder regions does this giant thrive.

Environment drives out some species and retains others. These few examples are variations in the same species which shows the effects of different surroundings.

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SOME OBSERVATIONS AND NOTES ON MUSCULIUM.

BY V. STERKI.

Most or all of our species of *Musculium* Link (*Calymenina* Clessin) are very variable. *E. g.*, of *M. securis* Pr. there are almost endless forms, some of them so different from others that they appear to be distinct species, even of different groups. They readily respond to the nature of their habitats, and almost every place has its own peculiar forms. It may be added that most of them are inhabitants of quiet waters: small lakes, ponds, pools, marshes, ditches, slow streams; but *M. transversum* Say is also found in rivers with strong current, with stony and rocky bottoms.

Years ago Clessin stated his belief that they are comparatively short-lived and of cyclical development, annuals. The first part of his statement is probably correct, the latter probably not, or not for all species; specimens at all stages of growth, from newly hatched to full-grown, can be found at any time of the year. Yet under certain conditions their development appears to be uniform; *e. g.*, where pools dry up in fall, only the young mussels appear to survive, to grow to maturity and propagate during spring and summer.

These mussels are described as having their beaks calyculate, or "capped," and the genus has been established mainly on that feature.¹ But in most and probably in all species, specimens and forms are found with slightly or non-calyculate beaks, and such are the rule

¹ Yet even without that supposed but mistaken character the genus appears to be well founded, as will be shown elsewhere.

rather than the exception in *M. transversum* Say. By the way, it may be said that calyculate beaks are found occasionally in specimens of *Pisidium* and *Sphærium*.

The nepionic (embryonic) mussel when discharged from the parent is generally well inflated (except in *M. transversum*), and then the postembryonal part of each valve is marked off from it by a constriction more or less deep. This seems to be especially well marked when the embryos have been retained by the parent for a long time, *e. g.*, over winter, and are overgrown, as it were.¹ Under favorable conditions the embryos are probably discharged as soon as sufficiently developed, moderately inflated, and then postembryonal growth goes on in the same direction without or with a slight demarcation line.

There are in my collection a number of lots of a *Musculium*, different from all other species described and known, from Rhode Island, Virginia, Ohio, Michigan, and remarkably alike. The mussels are somewhat like medium-sized *M. securis* Pr., but more elongate, moderately and evenly inflated; the anterior and posterior parts are less disproportionate, the latter is less high, less and more obliquely truncate, the beaks are not calyculate, rounded, comparatively broad and not very prominent; even under the microscope, no demarcation line between the embryonal and postembryonal parts can be seen; the surface is markedly regular, without or with slight lines of growth, with very fine striæ and a slight silky gloss; the color is dark horn, not yellowish, somewhat lighter along the margins, but there are no sharply defined zones, as common in *securis*. Isolated, this *Musculium* would appear to represent a distinct species; but younger specimens, evidently of the same form, have more the outlines of *M. securis*, and in every lot there are some specimens of the same, with the beaks calyculate, and generally there are intermediate ones, as to outlines and general appearance. Several of the lots were collected in fall, from September to November, and others probably so. It appears probable that this is a summer form of *M. securis*, of fast and steady growth under favorable conditions, consequently not a variety. Corresponding forms of other species have also been seen. If verified by future observations, this is a remarkable and very interesting fact.

Also the varieties and local forms of all species, and the conditions

¹ Under the microscope such specimens show several concentric zones along the margins of the valves, marked by lines of growth.

under which they grow, should be carefully studied. In order to do this much more good material is needed from all over the continent. It is very desirable to collect repeatedly, throughout the year, at favorable places, wherever there is an opportunity for doing so; it is essential to have the date of collecting with every lot, notes on the nature of the habitat, and last but not least, to have good numbers of specimens, not only the large ones, but also the half-grown and young. Any material, from anywhere, will mean a contribution to our knowledge.

It may be added that the simplest and best means for collecting small fresh-water mollusca, Sphæriidæ and gastropods, is a sack net of good burlap on a frame of strong wire ($\frac{1}{5}$ – $\frac{1}{4}$ inch), the ring of about 6–8 inches diam., tied to a handle of suitable length, *e. g.*, a broomstick. In this net mud and other material, scooped up from the surface of the bottom, is washed, the coarser things gradually removed; the remainder is taken home and dried well, but not in too great heat. Then, a small sieve, *e. g.*, a strainer, or several of different mesh measures, are very serviceable for separating finer and coarser material, and it will be much easier to pick out the specimens, of which the smallest should not be overlooked; some *Pisidium* are not larger than 1 to 2 mm. when mature. Specimens to be sent for examination are best left mixed up, or separated only for considerable differences of size. The washings and specimens must be handled carefully, especially *Musculium*, since most of them are very fragile. The whole "stuff," dirt and all, fresh or dried, may be sent for examination, after the coarser materials are removed.

For deep water a drag-net or small dredge of burlap will do good service, especially if protected by an outer sack of strong canvas with the bottom left open. It is very desirable that collecting be done in lakes and deep rivers.

DESCRIPTION OF A NEW FOSSIL LYMNÆA.

BY F. C. BAKER.

LYMNÆA NASHOTAHENSIS n. sp.

Shell elongated, somewhat pyramidal; surface dull, growth-lines conspicuous, crossed by fine, impressed spiral lines; whorls 6–6½, rather rapidly increasing in diameter, flatly rounded, the body whorl very large and quite convex or even gibbous; spire broadly pyramidal or conic, longer than the aperture; sutures well marked; aperture

long, ovate, much narrowed above, generally wide and flaring below; outer lip with variceal thickening; inner lip rather broad, reflected over the umbilical region, forming a conspicuous expansion and leaving a well-marked umbilical chink; parietal callus wide and rather thick, in some specimens rendering the aperture continuous; axis twisted; the columella is plicate in the immature shell, but in adult or old specimens the inner lip is raised over the umbilicus, somewhat as in *emarginata*.

Length 33.50, breadth 13.00; aperture length 14.00, breadth 7.00 mm.

Length 29.00, breadth 13.00; aperture length 15.00, breadth 6.75 mm.

Length 28.75, breadth 13.50; aperture length 15.75, breadth 7.00 mm.

Length 25.00, breadth 12.00; aperture length 14.00, breadth 7.25 mm.

Length 21.00, breadth 10.00; aperture length 12.00, breadth 6.00 mm.

Length 24.00, breadth 10.00; aperture length 11.00, breadth 5.00 mm.

Length 18.25, breadth 8.25; aperture length 10.00, breadth 4.25 mm.

Types: The Chicago Academy of Sciences, 9 specimens, No. 24539; cotypes, Academy of Natural Sciences, Philadelphia, No. 98521, 6 specimens.

Type locality: Marl beds, Nashotah, Waukeshaw County, Wisconsin.

Remarks: *L. nashotahensis* was at first thought to be a form of *Lymnæa danielsi*; it differs markedly from that species, however, in several particulars—the spire is broader and not so acute, the body whorl is larger and inclined to be gibbous, there is a conspicuous umbilical chink (*danielsi* is usually imperforate), and the columella is not noticeably plicate. In *nashotahensis* the aperture is elongate ovate, narrowed above and broadened below, where it is often patulous. The upper whorls are strongly suggestive of *Lymnæa reflexa*, the penultimate whorl having the swollen appearance so characteristic of *reflexa*.

Young specimens somewhat resemble *Lymnæa catascopium*, differing in being narrower, with a more elongate aperture, longer and less

rounded whorls and a less distinctly plicate columella. There is also an umbilical chink, which is usually absent in *catascopium*.

Like Walker's *Lymnæa bakeri* from Michigan, *nashotahensis* is apparently an extinct species peculiar to marl deposits. The specimens were secured by Mr. F. M. Woodruff.

NOTES ON PLANORBIS II: P. BICARINATUS.

BY BRYANT WALKER.

(Concluded from May Number.)

IX. Miscellaneous.

In Beck's Index Moll. (1837), p. 118, the following synonymy of this species is given:

"*Planorbis bicarinatus* Say. Am. Septr. C. C.

a. major. S. g. iv, 4. W. S. vii, 12. Fl. Schuylkill.

Pl. angulatus Wood.

b. minor.

an *P. eburneus* Ch. ix, 1123? New Jersey."

P. angulatus Wood, Index Testaceologicus, edit. II, 1828, Suppl., pl. 7, f. 12, is a typical *P. bicarinatus*. The figures in Sowerby's Genera, referred to by Beck (as "S. g.") are the same species.

Beck defined his *minor* only by a queried reference to Chemnitz's figures of a West Indian species, really entirely different.

DISTRIBUTION.

The recorded distribution of *Planorbis bicarinatus* is shown with approximate exactness upon the accompanying map (pl. III). These data are primarily based upon the collection of the Philadelphia Academy, the complete list of which has been kindly furnished by Dr. Pilsbry. To these have been added such additional information as was afforded by my own collection. The localities thus vouched for are indicated on the map by the black dots. These data have been supplemented by such specific localities as a careful search of the literature at my command afforded. These citations are represented by the outlined dots. Duplicate citations and those giving simply the "State" have been omitted. A detailed list of all localities and the authorities for the same is given below. The map does

not extend far enough north to allow the localities in Keewatin, Canada, to be plotted.

While the exhibit as a whole affords what is probably a fairly accurate view of the actual distribution, yet it also shows how lamentably small our knowledge really is of the range of one of our most common species, and how much still remains to be done before any generalization can be other than tentative. Still the chart is of interest as showing what we do know, and serves to indicate the regions to which attention of American collectors should be particularly directed. Thus the apparent absence of the species from the entire littoral Atlantic region (with the exception of a single record from Wilmington, N. C.) from the Potomac to Florida, and along the coastal region of the Gulf from Florida to Texas is very striking and worthy of investigation. So, too, the exact range towards the west is important and of considerable scientific interest. No doubt many of the deficiencies of the present map can be supplied from material already accumulated in the many private collections of the country, and it is hoped that this review of the subject will induce the publication of all such information for the benefit of those interested in the geographical distribution of the American fauna. For it is only by the accumulation of detailed information, such as is afforded by the publication of carefully authenticated local lists, accompanied by exact localities, that any substantial advance can be expected.

Taking the chart, such as it is, certain facts can be deduced with a great degree of certainty, while others must still remain more or less tinged with uncertainty until more exact knowledge shall either prove or disprove them. On the north it seems reasonably certain that *bicarinatus* extends through British America from Anticosti, New Brunswick and Nova Scotia west to at least Lake Winnipeg and Manitoba and north to Keewatin. In all probability it may be found to range west through Saskatchewan and Assiniboia well toward the Rocky Mountains.

The data already accumulated shows a distribution through the northern United States from Maine to Oregon. The northwestern data, though scant, tend to show that the invasion of the valley of the Columbia was through transfer from the headwaters of the Missouri or its tributaries to the Snake, Pend Oreille or other tributaries of the Columbia.

The accuracy of that veteran collector, Henry Hemphill, as to its occurrence at Antioch, California, quoted by Stearns (1881), is not to be questioned. But the fact that there is no other record of its occurrence in California certainly tends to show that the Antioch find was a sporadic colony, accidentally introduced, and which never succeeded in effecting a permanent foothold.

The citation of this species from the Yaqui River, Guaymas, Mexico, on the Gulf of California, by Stearns (1889), where it is said to have been collected by Palmer, is open to more doubt. It appears that *Polygyra hirsuta* was also alleged to have been collected at the same time and place. The nearest authentic locality for this species is southwestern Missouri. There is no evidence that *bicarinatus* has ever been discovered anywhere in the Colorado basin. The occurrence of two common eastern species at the same time in a locality so remote from the known range of either is certainly very remarkable, and would naturally raise a question as to whether there had not been an accidental mixing of specimens. *Bicarinatus* is not quoted from Mexico at all by Crosse and Fischer, and its occurrence at Guaymas is very improbable.

Leaving these two doubtful citations out of the question, the only authentic occurrence of *bicarinatus* on the Pacific coast is along the Columbia in Oregon; south of that the Rocky Mountains, no doubt, mark the western range of the species.

In the Potomac River at and below Washington, D. C., *bicarinatus* is an abundant species. South of that, with the exception of Wilmington, N. C., so far as the records show, it is absent from the entire coastal Atlantic region. In western North Carolina and northwestern Georgia it is found in streams belonging to the western drainage. We have no records from South Carolina and Florida. The large amount of collecting that has been done in various parts of the latter state goes to show that it does not occur there. South Carolina is practically unknown conchologically. It was not found by Henderson at Yemasee, Beaufort Co. (NAUT. XXI, p. 7). Mr. Wm. G. Mazyck, of Charleston, S. C., informs me that he has never known of its occurrence in that state, and that it is not quoted in either of Ravenel's Catalogues of 1834 or 1874. In Alabama, though not abundant, it occurs in the northern part of the state, and extends in the Alabama drainage as far south at least as Pinehill, Wilcox Co. There are no records for either Mississippi or Louisiana.

In Texas it is an abundant species, at times, in the central eastern part of the state, and no doubt ranges north from there. But there are no records from the valley of the Rio Grande and, as stated before, none from Mexico. This river would therefore seem beyond the southwestern range of the species.

So far as the records show, it is apparently absent from the entire coastal region on the Gulf.

Since the above was written and the map (Plate III) was prepared, Mr. H. H. Smith has collected typical *bicarinatus* in Beaver Creek, Conecuh Co., Ala. This "find" not only carries the species further south than previously recorded, but brings it into the western extension of the Atlantic fauna area along the Gulf Coast. Beaver Creek is a tributary of Murder Creek, which forms part of the Escambia River drainage system.

West of the Appalachian Mountains, *bicarinatus* is, in suitable localities, a common species in all the states as far west as Kansas and Colorado, and there is no great doubt but that it ranges, in suitable environment, west to the mountains. But the data at hand are too few and too scattering to give any exact information as to the limits of the western range. They are indicated on the map and given in detail in the following list:

DISTRIBUTIONAL DATA.

United States.

Alabama: Big Willis Creek, Atalla; Coosa River, Minnesota Bend; Black Warrior River, Jefferson Co.; Cub Creek, Pinehill; Princeton (Walker); Beech Creek, Selma; Cahawba River (Lewis); Coosa River, Farmer (Hinkley).

Arizona: None.

Colorado: Boulder (Pils.); Lodge Pole Creek, Logan Co.; Owens Lake, Boulder; Weld Co.; Greeley (Henderson).

Connecticut: West Granby, Hartford Co. (Pils.).

Arkansas: White River, Carroll; Big Creek, Sebastian; Ouachita River, Hot Spring (Sampson).

Delaware: Brandywine River, between Dupont's and Rockland (Pils.).

District of Columbia: Washington (Pils.).

Florida: None.

Georgia: East Rome (Pils.); Silver Creek, East Rome; Armuchee Creek, Rome; Dalton (Walker).

Idaho: Old Mission (Pils.); Blue Creek, Cœur d'Alene Mountains; Cedar Creek, Priest Lake (Walker).

Illinois: Athens; Rock Island (Pils.); Joliet (Ferriss MSS.); Cook Co.; LaSalle Co.; Des Plaines River; Kappa, Panala, Woodford Co.; Crystal and Silver Lakes and Algonquin, McHenry Co.; Mercer Co.; Elgin, Kane Co.; Illinois River and Dogfish, Quiver and Matanzas Lakes, Havana, Mason Co.; Fourth, Sand, Cedar, Fox, Pistakee, Clear, Long and Slough Lakes, Lake Co.; Pope Co.; Johnson Co.; Thompson's Lake, Fulton Co.; Milan, Rock Island Co.; Pekin, Tazewell Co. (Baker).

Indian Territory: Tushkahama (Ferriss, MSS.).

Indiana: Randolph Co. (Pils.); Cedar Lake; Bass Lake, Stark Co. (Baker); Connorsville, Danville (Walker); Richmond, Wayne Co. (Plummer); Indianapolis, Whitewater Basin, West Whitewater Basin, Maumee Basin, St. Joseph Basin, Lake Michigan Basin (Call), Franklin Co. (Moore and Butler); Lake Michigan, Michigan City; Lake James, Steuben Co.; Clear Lake, LaPorte Co. (Daniels).

Iowa: Iowa City; DeWitt; Clear Lake; Davenport (Pils.), Muscatine, Des Moines, Ruthven (Walker); Spirit Lake (Keyes).

Kansas: Walnut Creek (Pils.); Topeka; Ellis; Soldier Creek, Silver Lake Twp., Shawnee Co.; Northern Wabaunsee Co.; Brown Co.; Cedar Creek, Mt. Ida; Barber Co.; McDowell Creek, Riley Co.; Kansas River, Wyandotte; Neosho Co. (Call).

Kentucky: Bowling Green (Pils.).

Louisiana: None.

Maine: Caribou, Aroostook Co.; Rockland, Knox Co. (Pils.); Orono, Fort Kent, St. John's River; Gelot's Lake, New Sweden; Second Lake, Fish River; Salmon Brook, Aroostook River; Woodland, Collins' Mill Pond, Portage Lake, Square Lake, Aroostook Co.; E Warren; Rockville (Walker); Cross Lake Inlet; Cross Lake; Moose River, Somerset Co. (Nylander); Moosehead Lake (Johnson); Portland (Pickering).

Maryland: Cumberland; Hancock; Chestertown, Kent Co.; Flintstone, Allegheny Co.; Conecocheque River at National Road (Pils.); Potomac River, Fort Washington (Walker).

Massachusetts: Pontoosuc Lake, W. Mass. (Pils.); Cambridge; Amherst (Walker); Fresh Pond (Adams); Swampscot, Lynn and vicinity (Tufts); Stockbridge (Ferriss, MSS.); Bristol Co. (Taylor and Shiverick).

Michigan: The writer has records from 52 of the 83 counties of the state, indicating a general distribution throughout the state. The counties represented are shown by the map (plate II).

Minnesota: Lake Albert Lea; Fergus Falls (Pils.); Stearns Co.; Lake Minnetonka; Cannon Lake, Rice Co.; Shackleton Lake (Walker); Minneapolis; Lake Minnewaska, Pope Co.; Vermilion Lake, Winona, Lake Co.; St. Louis Co. (Grant); Clearwater, Wright Co. (Sargent); Harriet Lake, Hennipen Co. (Daniels); Heron Lake, Jackson Co.; Eagle Lake, Sherburne Co. (Stearns).

Mississippi: None.

Missouri: Pettis Co.; Lamar, Barton Co. (Sampson).

Montana: Mingusville, now Wibaux (Squyer).

Nebraska: Sidney (Walker); streams of eastern Neb. (Aughey); Omaha (Tryon).

Nevada: None.

New Hampshire: Profile Lake (Walker); Keene (Walker and Coolidge).

New Jersey: Greenwood Lake, Passaic Co.; Raritan River; Cedar Lake, White Pond, Warren Co.; Swartzwood Lake, Sussex Co.; Center Twp., Camden Co.; Delaware Water Gap; Princeton, Mercer Co.; Lake Hopatcong, Budd's Lake, Morris Co.; Hackensack Valley; Closter, Bergen Co.; Trenton; Gloucester Co. (Pils.).

New Mexico: Las Vegas; South Spring River, Roseville; Trementina; Santa Fe; Arroyo Pecos, Las Vegas (Pils.).

New York: Cazenovia; Skaneateles Lake; Long Island; Niagara; Hudson River, Fort Warren, Ridgewood; Racquette Lake, Hamilton Co.; Queens Co.; Squaw Island, Niagara River; Troy (Pils.); Gannagagee Creek, Erie Co.; Alfred; Watertown; Canandarago Lake, Otsego Co.; Cedar Lake, Herkimer Co.; Old Forge (Walker); Sunset Creek, Otsego Co. (Smith); Chatauqua Lake (Maury); Schuyler's Lake, Otsego Co.; Mohawk River, Little Lakes and Erie Canal and Litchfield, Herkimer Co. (Lewis); Onondaga Co. (Beauchamp); Rochester (Walton); Huntington, Centerport, Long Island (Smith & Prime); Cayuga Lake (Ferriss MSS).

North Carolina: Asheville; Greenfield Pond, Wilmington (Walker).

North Dakota: Hankinson (Pils.); Fort Stevenson (Stearns).

Ohio: Columbus; Geauga Co. (Pils.); Hudson (Walker); Cincinnati (Harper and Wetherby); Tuscarawas Co. (Sterki); "The Reserve" (Naturalist).

Oklahoma : Oklahoma City (Ferriss); Cimmaron River (Call).

Oregon : Willamette River; Salem; Portland (Pils.).

Pennsylvania : Delaware River (type locality), Say; Allegheny River; Round Island, Clinton Co.; Port Allegheny, McLean Co.; Youghiougheny River, Connellsville, Fayette Co.; Juniata River, Hollidaysburg, Blair Co.; Susquehanna River, Muncy; Cushelishia Creek, Indiana Co.; Emporium, Cameron Co.; Amity Twp., Berks Co.; Beaver River, Waupum, Montgomery Co.; Germantown and various localities, Philadelphia Co.; Nockamixon, Bucks Co.; Schanksville, Somerset Co.; Glenolden, Delaware Co.; Gettysburg; Ligonier, Westmoreland Co., York Furnace, York Co. (Pils.); Allegheny Co. (Stupakoff); Ohio River, Coraopolis (Rhoads); Chester Co. (Hartman & Michener); Lancaster Co. (Haldeman); Columbia; Susquehanna River, Wilkesbarre (Walker).

Rhode Island : Providence and Worcester Canal; Cunliff's Pond (Carpenter).

South Carolina : None.

South Dakota : Mouth of Big Sioux River (Lea).

Tennessee : Emory River and Harriman (Pils.); Chilhowee Mts., Blount Co.; Franklin Co. (Walker); Tellico River, Blount Co. (Lewis); Little River (Ferriss MSS).

Texas : New Braunfels (Pils.); San Antonio (Walker); Pedernales River, Gillespie Co.; Brushy Creek, Williamson Co.; Colorado River and tributaries, Comal Co.; San Marcus River, Hayes Co.; Colorado River and tributaries, Travis Co.; Burton, Washington Co. (Singley); Hog Creek, McLennan Co. (Strecker).

Utah : None.

Vermont : Connecticut River, Hartland (Pils.); Middlebury (A ms)

Virginia : Luray (Pils.); Orange (Walker); Harper's Ferry (Tryon).

Washington : Cascades, Skamania Co. (Pils.).

Wisconsin : Milwaukee (Pils.); Menominee River; Wauwatosa; Honey Creek, Layton Park; Kinnickinnic River, Milwaukee; Golden Lake, Waukesha Co.; Little Cedar Lake, Washington Co.; Lake Winnebago, Calumet Co.; Kenosha (Chadwick).

West Virginia : Four miles from Romney; Kanawha River, forty miles south of Ohio River, Wirt Co.; North River, Sedan, Hampshire Co.; Warm Spring Creek, Morgan Co.; Salt Sulphur Spring,

Monroe Co.; Patterson's Creek, Mineral Co.; Potomac River, Cherry Run (Pils.); Potomac River, Harper's Ferry (Walker).

Wyoming: Yellowstone National Park (Stearns).

Dominion of Canada—Quebec: Meaches Lake, Hull; Chaudiere River; Chelsea (Pils.); Caprouge (Walker); Anticosti (Latchford); Brome Lake, Knowlton (Whiteaves MSS).

Ontario: Sparrow Lake, Simcoe District; Puzzle Lake, 40 miles north of Napanee; Rideau River; Ottawa River (Pils); Little River, Walkerville (Walker); Lake Simcoe (Stearns).

Algoma: Dog River, north shore Lake Superior; Gores Bay, Manitoulin Island, Lake Huron (Walker); Moose Factory, Hudson Bay (Dall).

Manitoba: Lake Winnipeg; Lake Manitoba (Christy).

Nova Scotia: Dartmouth Lakes (Jones).

Keewatin: Lake St. Joseph; Kawinogans River, Albany River. Knee Lake (Whiteaves); Saskatchewan River, Grand Rapids (Dall.);

New Brunswick: Kennebecasis River and elsewhere (Matthew and Stead).

Mexico: Yaqui River, Guaymas, W. Mexico (Stearns). See p.

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EXPLANATION OF PLATE I.

All the figures are $\times 2$, except Fig. 10, which is $\times 3$.

Fig. 1. *P. bicarinatus aroostookensis* Pils. Collins' Mill Pond, Me.

Fig. 2. *P. bicarinatus aroostookensis* (topotype). Salmon Brook, Me.

Fig. 3. *P. bicarinatus* Say (typical). Delaware River, Philipsburg, N. J.

Figs. 4 and 5. *P. bicarinatus angistomus* Hald. Independence Lake, Washtenaw Co., Mich.

Figs. 6–8. *P. bicarinatus unicarinatus* Hald (type). Schuylkill River, Pa.

Fig. 9. *P. bicarinatus portagensis* Baker (cotype). Portage Lake, Me.

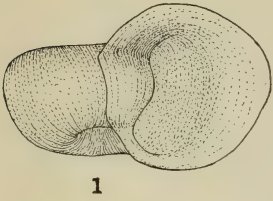
Fig. 10. *P. bicarinatus corrugatus* Currier (type). Perch Lake, Kent Co., Mich.

Fig. 11. *P. bicarinatus royalensis* Walker (type). Siskowit Lake, Isle Royale, Mich.

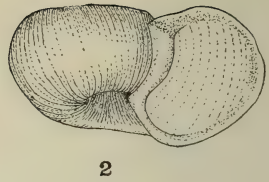
Fig. 12. *P. bicarinatus percarinatus* Walker (type). Crystal Lake, Benzie Co., Mich.

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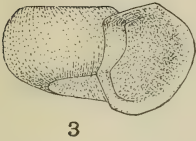
AN INTERNAL SEPTUM IN HOLOSPIRA BARTSCHI.—In a specimen of this snail cut open there is a vertical septum across the cavity at about the middle of the eighth whorl. It is concave on the lower side, as in many *Urocoptidæ*. To abandon the early whorls is very common in Antillean and the larger Mexican forms but has not before been noticed in *Holospira*. The internal column in *H. bartschi* is very nearly one-third the diameter of the shell at the widest part, but it decreases to about one-fourth in the penultimate whorl.—H. A. PILSBRY.



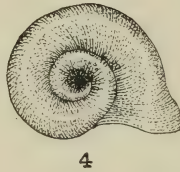
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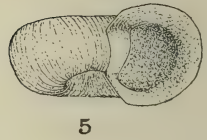
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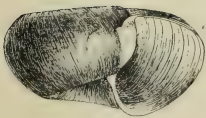
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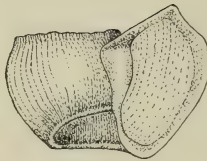
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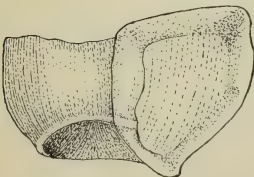
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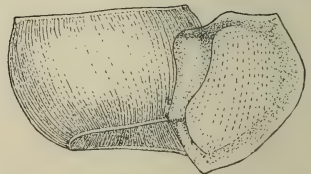
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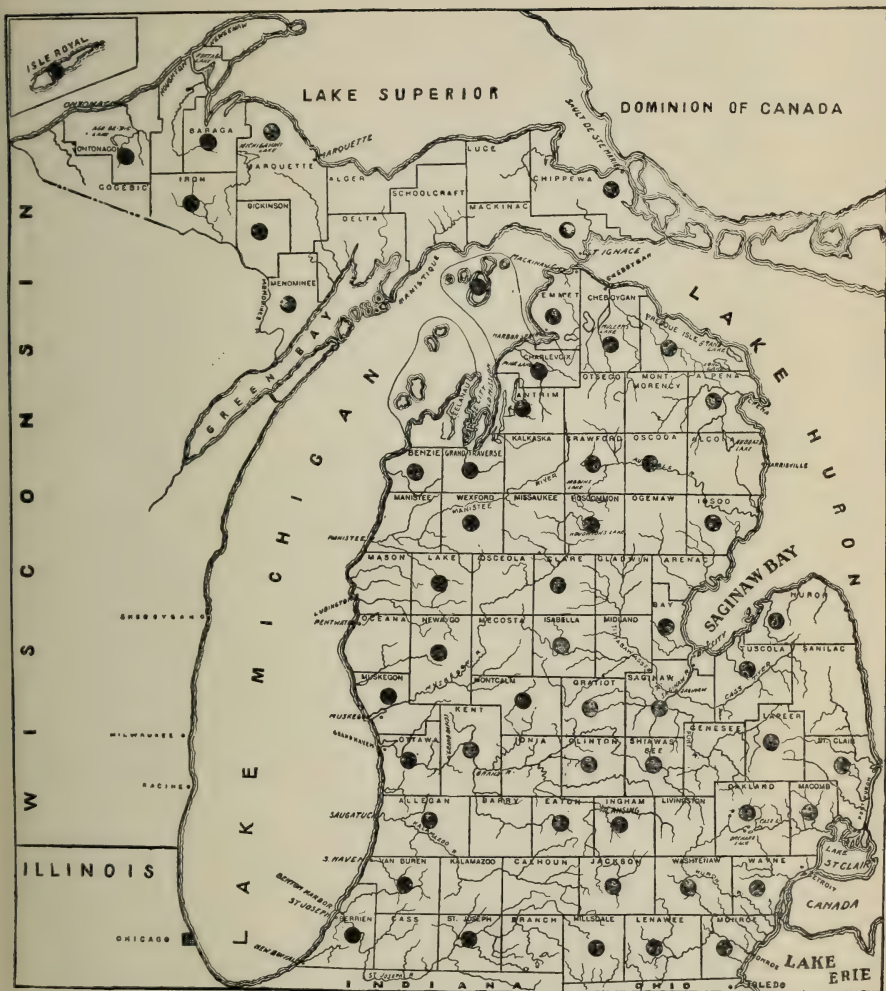
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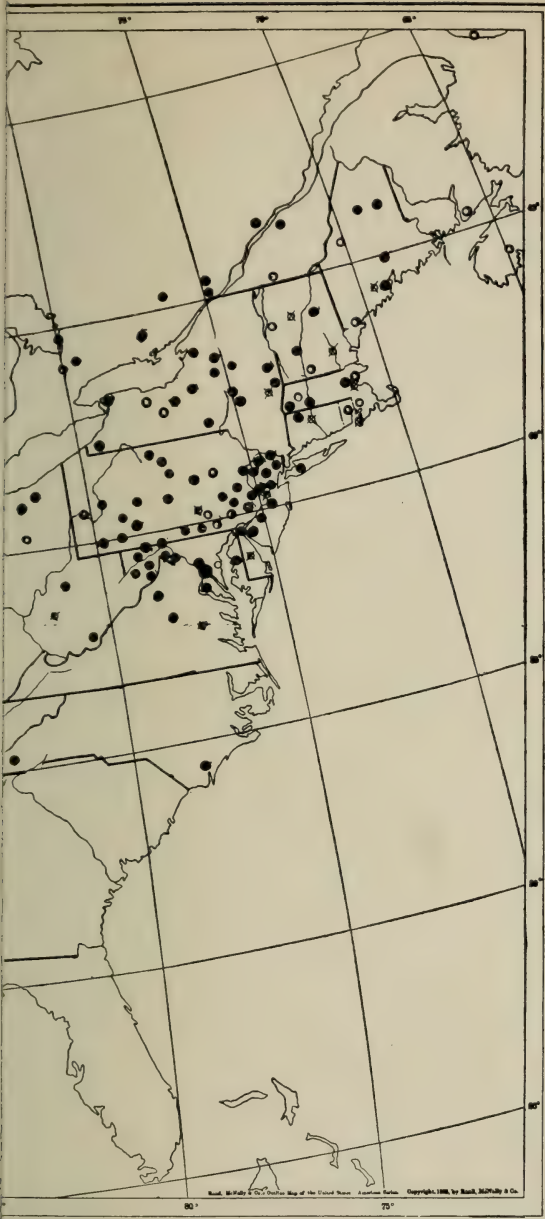


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DISTRIBUTION OF *PLANORBIS BICARINATUS* IN MICHIGAN.

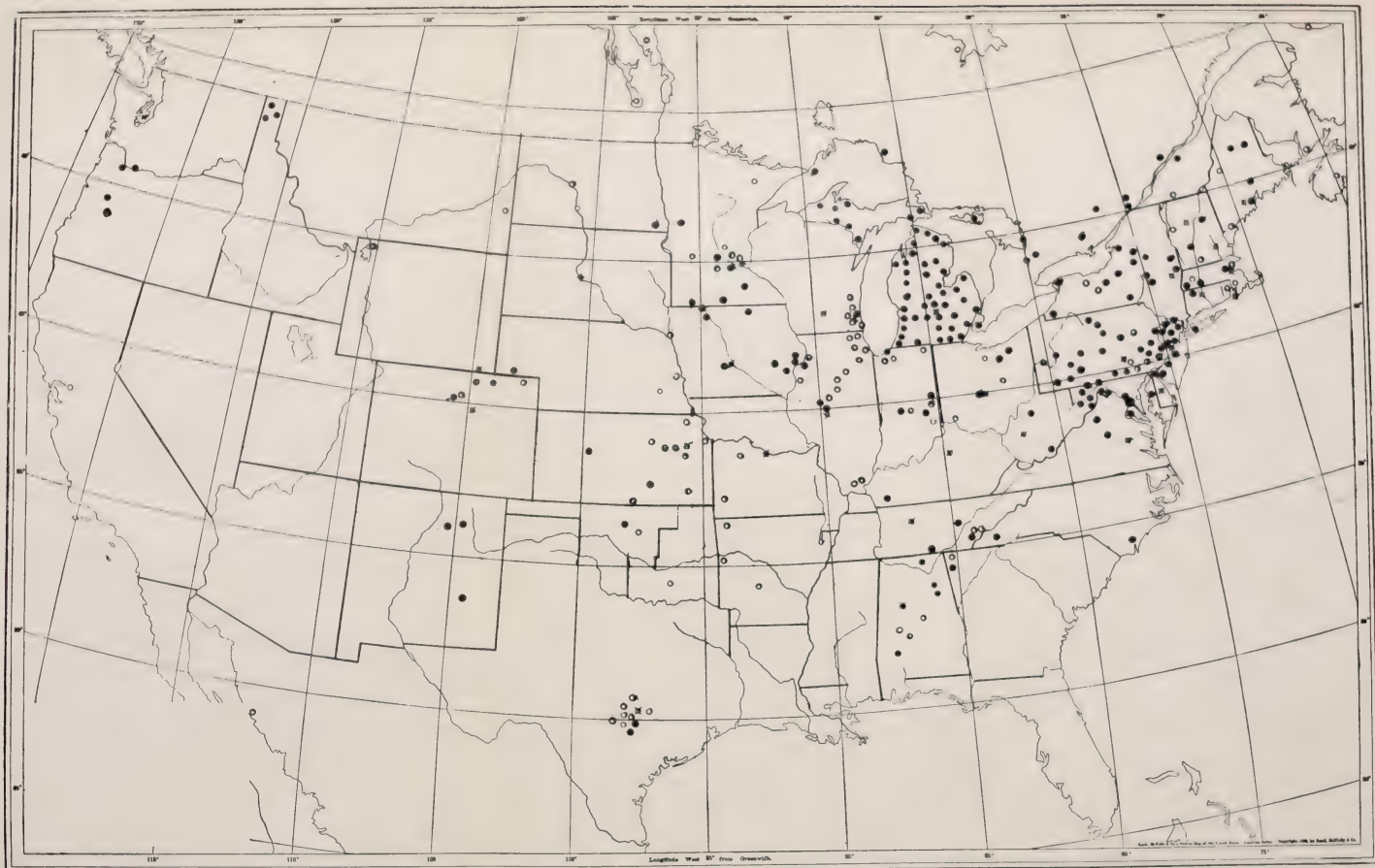


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DISTRIBUTION OF PLANORBIS BICARINATUS.

THE NAUTILUS.

VOL. XXIII.

JULY, 1909.

No. 3.

A SPRING COLLECTING TRIP.

Notes on New England Nudibranchs II.

BY FRANCIS N. BALCH.

In a recent number of the "Nautilus"¹ I recorded two occurrences of nudibranchs at Cohasset, Mass., indicating marked local condensation of the partly grown Eolid population during the time of a supposed autumn migration of the year's brood to deeper waters.

The condensation of adults at the breeding season is of quite a different order and much more familiar. The supposition is that the year's adults migrate from deep water to the shore, there to spend a brief mating season, spawn, and (for the most part) die. It is well known that early spring is the breeding season for most of the species, while others appear to select late autumn or winter—facts which go far to explain our woeful ignorance of this group in this country. At times, in other countries, these mating forms have been found abundant and gregarious to such an extent as to justify the expression "swarming" for the habit.²

¹ Vol. xxii, No. 2, June, 1908, pp. 13-16. "Two interesting New England Nudibranch Records." The sub-title "Notes on New England Nudibranchs. I." was accidentally omitted by the printer. P. 15, top line, after word "and" insert "T." For other errata see Nautilus, xxii, No. 6, Oct., 1908, p. 60.

² I use the term "swarming" in this paper to indicate a distinct gathering together, in *relatively* great abundance, for breeding.

Eliot ("On some Nudibranchs from East Africa and Zanzibar." Pt. V.; P. Z. S., 1904, ii, p. 87) furnishes a description of such a "swarming" of *Trevelyana crocea*,

From April 26 to 30, 1908, I was able to devote a short vacation exclusively to a minute examination, as exhaustive as time permitted, of the nudibranch life on two short stretches of coast suitable for breeding Eolid nudibranchs. The first was a stretch of granite ledges and piles of broken boulders at Rocky Neck, in Gloucester Harbor; the second a stretch of granite ledges at Brace's Cove, on the outer (eastern) side of Eastern Point, Gloucester, Mass. The localities were quite unlike in biological character, though resembling each other as shore formations. The Rocky Neck locality was bathed by the comparatively warm and still waters of the harbor, thick with larvæ, eggs, spores and organic débris of all kinds. Innumerable small and rather deep pools among the broken boulders, thickly hung and often completely choked with fuci, sheltered abundant animal life, including *Metridium* and hydroids. The Brace's Cove locality was pounded by the eternal surf of the open Atlantic, and the water was noticeably colder and crystal-clear. The pools on the massive ledges were much larger, shallower and more open. Corralines were abundant, hydroids and *Metridium* much fewer.

a Polycerid from Zanzibar, as follows: " * * * this form provided a most striking case of the migration of molluscs in flocks to shallow water for the deposition of spawn. But a few specimens were collected before a certain period of a few days' duration, when the sand of Chuaka Bay just below low-tide mark was occupied by astonishing numbers * * *. These were not washed up by accident, but were all actively crawling on the sand among the weeds, etc. Many were *in coitu*, and when placed in basins of sea-water most of the specimens were soon engaged in copulation or the deposition of yellow egg-ribbons. By-and-by the swarm disappeared to some unknown permanent habitat. If this were in the deeper channels of the bay (1 to 2 fathoms deep at low tide) they must have been found there by dredging. As this was not the case it seems most probable that the migrations of these tiny animals extend to and from the deep sea three or more miles away."

One may be permitted to guess that the "unknown permanent habitat" to which "the swarm disappeared" was that bourne from which no traveler returns! Quite probably the form may be found to be strictly annual with little or no overlap of generations, as I believe is the case with various of our own forms. Either the young escape observation till just about the breeding season (possibly making a very sudden and rapid growth at that time which may be marked by a change in food supply) or else, and more probably, the young straggle back to deep water as they grow stronger, but while still small, and, there attaining their growth, make a sudden descent (or ascent!) upon the shore *en masse* at the next call of the breeding impulse.

No temperatures were taken, for on the face of it the temperature was not the controlling factor at that time and place, the same forms and spawn occurring indifferently in shallow, sun-warmed pools pleasant to the hands, and in deep, unsunned crevices at extreme low tide when one's breath condensed in clouds over the numbing water. This is not to say that temperature may not be the controlling factor in the initiation of the migration impulse or even in the actual deposition of spawn, which latter may perhaps always take place at high water when the temperature conditions of the pools would be equalized.

The section worked at Rocky Neck did not exceed 300 yards in length, and at Brace's Cove about 200. Three days were given to the former and one to the latter. Every day-light tide was worked industriously, and attention was wholly concentrated on nudibranchs.

The "census" was as follows:

Coryphella rufibranchialis mananensis (Stimps.),¹ typical, 43 specimens collected and about 30 more seen—total, say 75. All but 6 at Rocky Neck. All well-grown, if not fully adult, except three or four apparently about half-grown.

Coryphella rufibranchialis chocolata var. nov. Externally not separable by me from the foregoing except by the color of the cores of the cerata and of the body, which is a true chocolate-brown, dark for the cerata, light for the body, as contrasted with the varied reds (varying from pink to ginger, salmon and scarlet) of the typical form. The dentition and internal anatomy have not yet been examined, but as there is undoubtedly intergrading in the color, no very distinctive character should be anticipated. I have seen this form before, but never more than one or two specimens at a time. As a mere color variety (and for all we actually know, a mere physiological phase) it may be thought not worth a name. At the same time the intergrades are few and the series incomplete; and the chocolate forms, in life, occurred markedly segregated from the others. It is at least possible to point out a tangible character by which it differs from typical *mananensis*, which no one has yet done for the differentiation of *mananensis* from *rufibranchialis*. Should *mananensis* prove

¹ So called by me for the present in the provisional belief that Stimpson's form—if separable at all, which I doubt—is only a variety of the European form. Our knowledge, and consequently the nomenclature, of the group of red-gilled Eolids on this coast is in deplorable condition.

a complete synonym (as Gould thought it), or a variety (as I consider it), then *chocolata* should be written as above; but if *mananensis* is a valid species (as Professor Verrill holds), then *chocolata* may be written as its variety pending further knowledge. Ten specimens collected, all at Rocky Neck.

Aeolidiella papillosa (L.). It is a question whether our American form may not be as well worth a varietal name as our form of *Coryphella rufibranchialis*. Both species are, in European waters, noted for their variability, and have enormous synonymies. I think it much the same sort of question as that whether it is worth while to distinguish our form of *Purpura lapillus*—doubtless it is extremely close to the European form, and no one has yet pointed out a constant diagnostic difference, yet an American lot could hardly be confused with a European lot. Our form of the present species, in my experience, runs shorter, stouter, pinker and less variegated than the European form, as shown by the numerous and excellent figures accessible. No diagnostic character has been found in the dentition. Eight specimens collected, of which four at each locality; one a giant of 9 cm., one of an ordinary full adult size of about 6 cm., three smaller adults of 4–5 cm., and one young of about 1 cm.

Cratena veronica Verrill. One specimen about 1.8 cm. long, taken at Rocky Neck among a thick growth of undetermined hydroids, agreed very closely with Verrill's description of this rare and unfigured species. It was kept alive four days during which colored drawings were made, and then preserved for dissection.

Galvina picta (A. & H.), one specimen, adult. Rocky Neck, on hydroids.

Doto coronata (Gmel.), one specimen, adult. Rocky Neck, on hydroids.

Dendronotus frondosus (Ascanius), three specimens, one large adult of about 6 cm., two about half that size; the latter at Rocky Neck, the former at Brace's Cove.

Acanthodoris pilosa (Müller), one specimen of about 1 cm., at Brace's Cove.

Lamellidoris aspera (A. & H.),¹ eighteen specimens, 5 mm. to 12 mm. long, all but three or four at Brace's Cove, on Corallines.

¹Our knowledge of the difficult and critical group of species centering around *L. aspera* and including a number of quite insufficiently characterized American forms has not reached a point where identifications can be looked on as reliable.

Ancula cristata sulphurea (Stimps.), one young specimen of about 8 mm., at Brace's Cove. It seems best to preserve Stimpson's name at any rate in a varietal sense though Bergh has united it with *cristata*. The differential character of the lower origin of the anterior appendages of the rhinophores is fully confirmed by my observation and seems pretty constant.

Total about 119 individuals, falling into 9 genera and 10 species or varieties.

The picture of local nudibranch life obtained from this bit of intensive collecting is tolerably clear.

Coryphella rufibranchialis mananensis appears to have been "swarming," not in the sense that it was enormously numerous—for the total figures are not impressive—but in the sense that adults were locally gathered together in far greater numbers than normal and with a distinctly gregarious habit, *e. g.*, six or eight in one pool, none in the next, rarely alone. The specimens ran remarkably uniform in size and lent support to the view that the species is an annual. None were seen *in coitu* either in the pools or in three days of captivity, but spawn was abundant and probably mating was about over for the year. Alder and Hancock say of the British form: "met with * * * in April, May and June, when it has attained its full size and is spawning. * * * In August and September the young are found considerably advanced." I believe our form will be found to have a more concentrated breeding season.

What has been said applies equally to the chocolate variety.

Aeolidia papillosa gave some slight indication of "swarming" in that it was considerably more numerous than normal, and gregarious in habit. But this was not nearly as marked as in the foregoing and the sizes were so conspicuously *not* uniform as to look against its being an annual. What I have seen in this and other years would fit well with its being a bi- or tri-annual with a "swarming" habit slightly later than that of *C. mananensis* and not so well marked. The spawn was fairly abundant and *all* of a *deep* rose color whereas Alder and Hancock say of the spawn of the British form that it is "occasionally white, but generally has a pinkish tinge, and is sometimes distinctly rose-colored." They give the breeding season as "spring and summer months."

The other forms taken present no indication of a sexual "swarm-

ing." It is true *Lamellidoris aspera* occurred in some numbers but the individuals varied much in size, were not markedly gregarious, and no spawn or coition was seen. The species seems to be a fairly common one at most times and according to Alder and Hancock breeds in May, June and July,—if indeed our species be identical.

None of the species taken are rarities except the var. *chocolata* (which, however, I have several times seen before) and *Cratena veronicae*, which has not before been publicly reported since its original description, but has been taken a few times by Verrill in comparatively deep water. The present specimen is about three-quarters the size given by Verrill. One may hazard a guess that it will be found to have a shore breeding season sometime in the winter.

The other species are those we have often with us on the shore in very small numbers. While such of them as are hydroid feeders are almost necessarily to some extent gregarious, I know of no account of anything like a "swarming" of any of them except *Ancula cristata*.¹

There is a certain fascination about the mysterious appearances and disappearances of these beautiful wanderers, and the first student fully to master a nudibranch (or at any rate an Eolid) life-history will have an interesting story to tell.

A collecting trip like this gives endless opportunity for alleged "observations" on "protective" and "warning," coloration and the like, which would be worth recording if fishes or other enemies looked with human eyes, from air into water, in full daylight, and *from on top*. Any true advance in this direction must be along the lines of work like Herdman and Clubb's most interesting experiments.²

52 Eliot St., Jamaica Plain, February, 1909.

¹ Herdman and Clubb. Third Report upon the Nudibranchiata of the L. M. B. C. District, Proc. and Trans. Liverpool Biol. Soc., iv, 1890, p. 134. "This species (*A. cristata*) was found * * * in April, 1890, and we took it in extraordinary profusion * * * in March, 1890. On one reef of rocks especially, a little way above low-water mark, there must have been many thousands of specimens present. For yards it was impossible to walk without treading on them, and handfuls were readily collected by scraping the specimens together from the mud-covered rocks." It should be remembered that for some reason the British coast supports nudibranch life in a vastly greater abundance of individuals, as well as of species, than ours does.

² *Loc. cit.*, ante, pp. 150-163.

NEW ENGLAND PYRAMIDELLIDÆ, WITH DESCRIPTION OF A NEW SPECIES.

BY HENRY W. WINKLEY.

A very excellent work on the New England *Pyramidellidæ* by Mr. Paul Bartsch has just been published by the Boston Society of Natural History. Specimens from the writer's cabinet were used in compiling this work. Unfortunately there are some omissions. I can blame no one but myself. My excuse is that my specimens were packed and stored, and a few collected later had not been worked up. Hence this supplement.

Turbonilla (*Ptycheulimella*) *polita* Verrill. Four specimens (determined by Verrill) are in the author's cabinet. The two best ones have ten whorls, and measure 7.5 mm. They are from Eastport, Maine.

Five specimens of *Odostomia*, collected at Provincetown, have the many lines of *trifida bedequensis*. They are about the size and shape of the P. E. I. specimens, and probably of that variety.

Odostomia (*Odostomia*) *modesta* Stimpson. Two excellent specimens of this species were found at Provincetown. They are slightly larger than the specimen used to illustrate Bartsch's article.

Odostomia bisuturalis. An interesting variety lacking the revolving line, occurs at Provincetown. Mention may be made of three pathological specimens of this species found at the same place. Deep sutures and everted lip, they are one of nature's jokes.



PYRAMIDELLA (SULCORINELLA) BARTSCHI n. sp. Fig.

Shell broadly conic, semi-transparent, vitreous. Nuclear whorls small, deeply obliquely immersed in the first of the succeeding turns,

above which only the tilted edge of the last volution projects. Post-nuclear whorls well rounded, moderately contracted at the sutures and appressed at the summit, which falls in the middle of the peripheral sulcus. Periphery of the last whorl somewhat inflated, marked by a moderately deep sulcus, which is bounded on each side by a slender raised thread. Base short, well rounded, with a moderately broad umbilicus. Entire surface of spire and base marked by strong lines of growth and numerous fine spiral striations. Aperture large, rhomboidal; posterior angle obtuse; outer lip thin; columella slender, curved and revolute, provided with a strong fold at its insertion.

The type is in the Winkley collection, and comes from Woods Holl, Mass. It has seven post-nuclear whorls and measures, length 3.2 mm., diameter 1.6 mm.

I take pleasure in naming this for Mr. Paul Bartsch, of the Smithsonian Institution, and wish to express my thanks to him and Dr. Dall for their help on this and other species.

Mr. Bartsch writes concerning the above: "The single specimen is a most interesting one; it represents a group (*Sulcorinella*) not heretofore reported living."

A NEW CARINIFEX FROM THE SANTA CLARA LAKE BEDS (PLIOCENE), CALIFORNIA.

BY HAROLD HANNIBAL.

CARINIFEX SANCTÆCLARÆ n. sp.

Shell small (for the genus), heavy, subglobular; spire depressed; whorls three, inflated, subcarinate at outer margin above, from which the shell slopes concavely upward to a raised ridge bordering a narrow, rather deep sutural groove. Umbilicus narrow, marked off by a sharp carina; lip complete, semilunar, full, reflexed below. Shell marked by moderate, diagonal growth-lines, occasionally raised into coarse ridges. Alt. 5 mm., lat. 8 mm.

Type locality: Near Los Gatos Limestone Quarry, Los Gatos, Santa Cruz Mts., Cal.

This species is easily recognized by the concave upper surface of the whorls. It varies somewhat in size, some specimens being twice as large as the type, which is probably just mature.

It and *Amnicola yatesiana* J. G. C. are the two characteristic

species of the Santa Clara Lake beds. Cooper¹ listed it as *Carinifex newberryi* var. *minor*, which he had described previously, from Clear Lake (living). The two have nothing specific in common except their size.

Associated with these two species at various points about the valley are the following species still living in northern California:

Anodonta cygnea nuttalliana Lea.

Anodonta angulata Lea.

Pompholyx effusa Lea.

Valvata virens Tryon.

In addition there are several indeterminate forms, an excellent flora, and fragments of mammalian bones.

The figure, which will appear in a later issue, represents the type, x 2, from a photograph by John Howard Paine, of Stanford University.

Stanford University, Cal.

NOTE ON PLANORBIS BINNEYI TRYON.

BY FRANK COLLINS BAKER.

Mr. Winkley's note on "Variation" in the last NAUTILUS is very interesting, and most of the examples given are characteristic. On page 16, however, there is a reference to *Planorbis* which shows that several species have been confused. The Dalton shells are *binneyi* and not *trivolv*, as I have ascertained recently from an examination of specimens in the Boston Society of Natural History, received from Mr. Winkley.

This large *Planorbis*, surpassed only by the *magnificus* of Pilsbry, has often been confused with *trivolv*, most authors overlooking Tryon's reference to this species in his review of Binney's work in the American Journal of Conchology.

P. binneyi is a northern form, in many localities replacing *trivolv*. I have collected it in Tomahawk Lake, Wisconsin, and in the St. Lawrence River at Thousand Island Park. It may be known by its large size, very *wide* whorls and pronounced longitudinal sculpture. Specimens of the same size are much wider than *trivolv* and more

¹ Cooper, J. G., Proc. Cal. Acad. Sci. (2), iv, p. 172, 1894.

corpulent. It has been identified as *corpulentus* Say, but this is a totally different species, the characters of which have been very fully described by Mr. Bryant Walker in a previous volume of the NAUTILUS.

It would be interesting to know the exact range of *binneyi*, and I would suggest that conchologists generally examine their collections for this species, sending the information to either Mr. Walker, of Detroit, or to me (or to both of us).

A large amount of exact data is needed to accurately determine the range of the various species of fresh-water pulmonates, and a few notes on this magnificent *Planorbis* will aid materially in this direction.

PISIDIUM MARCI, N. SP.

BY V. STERKI.

Mussel rather small, well inflated, high, slightly inequipartite and oblique, with outlines well rounded; superior margin short, nearly straight, with a rounded angle at its posterior end and a very slightly marked one at the anterior; posterior and inferior margins forming one regular, nearly circular curve, supero-anterior slope slightly marked; beaks little posterior, large, somewhat flattened, well prominent; surface shining, with medium fine, irregular striæ and several distinct lines of growth, the upper one marking off the nepionic mussel (as in *Musculium*); color straw to yellowish-horn,¹ with slightly marked lighter and darker zones; hinge short, rather slight, but well formed, with a short ligament, plate narrow; cardinal teeth somewhat curved; the right one moderately long, its posterior part thicker and grooved; left anterior very short, "high," abrupt, thin, the posterior almost longitudinal, twice as long as the anterior, less "high," slightly thicker and grooved in its posterior part; lateral cusps short, pointed, the outer ones of the right valve smaller but distinct, not pointed.

Long. 3.5, alt. 3.4, diam. 2.5 mm.

Habitat: Mt. Leidy, Utah, at 10,000 feet, in a stagnant pond, collected by Mr. Marcus H. Dall (son of Dr. Wm. H. Dall), in whose honor the species is named, on September 18, 1905.

This *Pisidium* appears not to be closely related to any of our

¹ Most specimens appear brownish from the dried soft parts.

described species, and cannot be referred to one, even taking into account the high altitude and the nature of the locality. It somewhat resembles some high forms of *P. scutellatum* St., but is less oblique, has broader beaks, and the surface striæ are coarser. The short, pointed inner lateral cusps of the right valve are notable. The nine specimens in the lot are remarkably uniform, two of them somewhat over half grown, the others apparently mature. The one opened for examining the hinge contained no visible embryos. The types are in the U. S. Nat. Mus., No. 187491.

NOTES.

A GIANT SQUID.—I received a letter to-day (April 2, 1909) from Provincetown which contains an item I think should go on record. It is as follows:

“The schooner ‘Annie Perry’ found a giant squid off Highland Light, Truro, Mass., last week and tried to hoist it on board the vessel, but the rope cut the body in half. It was perfectly fresh, and the crew took some of it for bait and caught quite a number of fish. I saw one of the tentacles which they brought ashore, and it was perfectly fresh then. It was seven feet six inches long, and the suckers were as large as a silver quarter. A piece of the body was, I should think, four inches in thickness and the tentacles must have been four inches in diameter at the larger end.”

The above must be the first record of the giant squid on our coast, although they must exist off shore in deeper water. I have written to see if I can secure the beaks or any part to aid in its identification.

(April 16, 1909.) I have received a little more information in regard to the giant squid taken off Highland Light, Truro. A letter to-day says:

“The captain of the vessel who took the squid says it was a very little larger than their dory, which is 16 or 17 feet in length. The tentacle which they brought ashore was $7\frac{1}{2}$ feet long and had ‘sucker cups’ the *whole length* of it.” [This would show it was one of the shorter tentacles.] “The whole animal was shaped like the common squid, that is, the body was not globular like the cuttlefish, but had fins or flippers on the tail just like the common squid. The piece which I wrote about was cut out of the side, and about four inches thick, and the whole body was about as large around (circumference)

as a fish-barrel. The tentacle was $7\frac{1}{2}$ feet long, four inches thick at the big end, and tapering away to a point."

The above is what was written to me, but my correspondent could not get any of the suckers, as the tentacle was thrown away before he received my letter.—J. HENRY BLAKE.

18 Prentiss St., Cambridge, Mass.

DR. VICTOR STERKI, of New Philadelphia, Ohio, known for his work on North American *Sphaeriidae* and *Pupillidae*, has been appointed an assistant in conchology in Carnegie Museum, Pittsburg. Dr. Sterki's collection became the property of the Museum some years ago.

FERGUSON COLLECTION.—It will no doubt be a matter of interest to the readers of THE NAUTILUS to know that the large and important collection of the late David Wilson Ferguson has been presented to Columbia University by his sons, W. C. Ferguson, Esq., and Professor George A. Ferguson, of Columbia. A room has been assigned for the exhibition of the collection in its entirety.—C. DAYTON GWYER.

THE CONCHOLOGICAL MAGAZINE.—With the April number (Vol. iii, No. 4), Mr. Y. Hirase has decided to suspend the publication of his journal until about May, 1910, when "No. 5, Vol. iii, will be sent to you in a finer and larger form." It is to be hoped that conchologists will support more generally this valuable publication, the plates alone being worth more than its subscription price. In the later numbers many new species have been described.

THE August number of THE NAUTILUS will again be omitted, owing to the absence of the editors during the greater part of July and August. The usual number of pages will be given by increased size of other months.

THE latest test when he comes home at 2 a. m. is to make him try to sing the chorus of the song:

She sells seashells on the seashore,
The shells she sells are seashells, I'm sure,
For if she sells seashells on the seashore,
Then I'm sure she sells seashore shells.

If he can, he's all right.

THE NAUTILUS.

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AUGUST-SEPTEMBER, 1909.

No. 4

MOLLUSKS FROM NORTHEASTERN MEXICO.

BY H. A. PILSBRY.

These shells were collected by Mr. A. A. Hinkley during the past winter, in the state of San Luis Potosi, Mexico. The Panuco river system has proved to be unexpectedly rich in fresh-water mollusks, having a fine group of *Unionidæ*, a remarkable lot of *Pachychili*, a new genus of *Pleuroceratidæ*, a *Gundlachia*, and various interesting *Amnicolidæ*. Among the latter there are several genera unlike any known American forms, and related to genera of the Old World. I have elsewhere called attention to a little snail found by Mr. Hinkley last year, *Coilostele tampicoensis*, which is closely allied to species of Spain, Syria and Arabia, but of a genus not before known in the western world. The two genera following, *Emmericia* and *Pterides*, seem to be similarly allied to European groups, and are certainly quite unlike any other American *Amnicolidæ* yet known.

EMMERICIA.

This genus was established by the late Professor Spiridion Brusina, of Agram, for a group of fresh-water snails resembling *Bithynia* in shape, but having a paucispiral operculum and a thickened, expanded lip, behind which there is a rounded ridge or wave. The species inhabit Dalmatia and the adjacent region around the head of the Adriatic Sea. The commonest and typical species is *E. patula* (Brumati).

Several species found in the state of San Luis Potosi by Mr. Hinkley are so close to *Emmericia* in conchological characters that I do not feel justified in separating them generically from that group,

though when the soft parts and operculum come to hand it is quite possible that the Mexican snails may prove to be generically distinct from the Dalmatian. They differ chiefly by wanting a swelling behind the expanded lip, and for this reason I erect for them the subgenus *Emmericiella*, type *E. novimundi*.

The Oriental group *Tricula* Benson, with a few Indian and Philippine species, resembles *Emmericiella*, but the inner lip is straightened, making the aperture narrow and piriform.

EMMERICIA (EMMERICIELLA) NOVIMUNDI n. sp. Pl. 5, figs. 9, 10.

The shell is imperforate but openly rimate, rather solid, ovate-conic, smooth and glossy. The spire is straightly conic, apex obtuse, the tip being depressed. Whorls $4\frac{1}{2}$, convex, separated by rather deep sutures; last whorl well rounded, ascending to the aperture. The aperture is oblong, vertical, or has the basal lip a little advanced. Peristome continuous, well expanded, thickened on the face and within; the outer lip is just perceptibly retracted near the upper insertion; basal margin well rounded; columella concave, thick. Parietal callus heavy, adnate, but with distinct edge in fully adult shells, spreading forward in front of the aperture. Length 3.1, diam. 1.9 mm.; longest axis of aperture, including peristome 1.65 mm. (fig. 10).

Bank of Choy River near the cave, State of San Luis Potosi.

The specimens are bleached; color in life unknown. These are two perfect examples of the same size. With these are associated several decidedly larger shells, in which the apex is broken, probably one whorl being lost. One of these—figured in profile, fig. 9—measures, length 3.5, aperture 1.9 mm., 4 whorls remaining.

EMMERICIA (EMMERICIELLA) LONGA n. sp. Pl. 5, figs. 11, 12.

The shell resembles *E. novimundi* but is more shortly rimate, of a turritid shape, with $5\frac{1}{3}$ more convex whorls. Aperture is more produced forward below, and the parietal callus spreads forward less. The outer and basal margins are well expanded. Length 4.1, diam. 2, longest axis of aperture including lip 1.6 mm.

Two complete and one broken specimen, found with the preceding species.

The new subgenus *EMMERICIELLA* is proposed for American *Emmericiæ*, in which there is no wave or ridge behind the lip-expansion, and the columellar margin of the aperture is built forward

more than in European forms, forming a conspicuously rimate umbilical region. Type *E. novimundi*.

PTERIDES, n. gen.

The shell is minute, rimate, long and narrow, composed of many convex whorls, (7 to 10 in known species); apex obtuse, the first whorl large. Aperture small, diagonal, elliptical, the peristome thin, continuous, expanded throughout or at the ends, where it is retracted to form shallow spout-like sinuses. Operculum and soft parts unknown. Type *P. pterostoma*.

These remarkable little snails are without relatives among known American genera. They may be compared only with a genus found about forty years ago in the flood-débris of the rivers of southern France and Spain, and described by Bourguignat under the generic name *PALADILHIA*,¹ and with another group, *LARTETIA*,² described from quaternary fossils found around Paris, but now known to inhabit subterranean waters and springs of central Europe, where most of the German species have been described as *Vitrella* Clessin.

Both *Paladilhia* and *Lartetia* are small, slender shells with the aperture ovate, the outer lip bending forward below, retracted near the upper insertion. In *Paladilhia* there is a rather narrow, Pleurotomoid notch above, leaving a sort of indistinct sinus-band; in *Lartetia* there is only a broad, rounded sinus. In my opinion the two groups are not generically distinct, *Lartetia* being at most a subgenus of *Paladilhia*.³

These forms, and especially the *Lartetia*, are apparently the nearest allies of the Mexican *Pterides*, which differs from them chiefly by the diagonal, oblong aperture with broadly expanding lip.

¹ *Paladilhia* Bourguignat, Monographie du Genre Palad., 1865. The type, *P. pleurotoma* Bgt., is a snail measuring 4x2 mm., found in the drift débris of the Lez, a little river near Montpellier, dept. de l'Hérault, and believed to inhabit subterranean watercourses.

² *Lartetia* Bourguignat, Catalogue des Mollusques terrestres et fluviatiles des environs de Paris à l'époque Quaternaire (in E. Belgrand: Le Seine—1, Le Bassin Parisien aux âges Antéhistoriques), pp. 15, 17 (1869). Type *L. belgrandi* Bgt.

³ The normal forms of the genus are those called *Lartetia*, *Paladilhia* being an extreme development in one or two species only; but the latter name has priority for the genus, having been described in 1865, while *Lartetia* dates from 1869.

PTERIDES PTEROSTOMA n. sp. Pl. 5, figs. 1, 2, 5, 6.

The shell is rimate, long and slender, composed of numerous slowly increasing, strongly convex whorls. Apex obtuse. Aperture diagonal, obliquely oval. Peristome thin, continuous, very broadly expanded, retracted and more broadly spreading at the two ends, where it is somewhat spout-like. Color unknown, the specimens being bleached.

Length 2.25, diam. of last whorl above aperture .75 mm.; longest axis of aperture 1.1 mm.; whorls 7 (figs. 5, 6).

Length 2.75, diam. above aperture .8, longest axis of aperture 1.2 mm.; whorls $8\frac{1}{2}$ (figs. 1, 2).

Eight specimens examined. There is considerable variation in length and number of whorls. Figs. 5, 6 represent the type.

PTERIDES RHABDUS n. sp. Pl. 5, figs. 3, 4.

The shell is very slender, slowly tapering to the rather large summit, composed of nearly 10 very convex whorls separated by a deep suture; last whorl very convex. Aperture small, elliptical, diagonal, rounded at both ends. Peristome thin, continuous, somewhat expanded, deeply sinused above, the parietal margin adnate for a short distance. Length 3, diam. above aperture .75, longest axis of aperture .7 mm.

Choy River near the cave, San Luis Potosi, Mexico.

This species is much narrower than *P. pterostoma*, with more whorls and a smaller aperture. The outer lip may perhaps become more expanded with further growth; if so it would apparently be like that of *P. pterostoma*. Described from a single specimen. While it may possibly prove to be an extreme form of *P. pterostoma*, I do not feel justified in uniting such unlike forms without evidence of intergradation.

PTERIDES BISINULABRIS n. sp. Pl. 5, figs. 7, 8.

The shell is very slender, slowly tapering from the very obtuse apex, composed of 8 smooth, strongly convex whorls, the last half of the last whorl free from the preceding. Aperture diagonal, elliptical, the peristome continuous, free, thin, hardly expanding except at the two ends, where it is retracted, slightly produced and flaring. The outer margin is arched a little more than the inner. Length 2.5, diam. above aperture .7, longest axis of the aperture .65 mm.

Gannina River, three miles S.-W. of San Dieguito, State of San Luis Potosi. A single specimen taken.

Smaller than *P. pterostoma* with the last whorl free, the aperture sinused at both ends, and the lip hardly expanded.

DESCRIPTIONS OF TWO NEW CUBAN LAND SHELLS.

BY DR. CARLOS DE LA TORRE, HAVANA, CUBA.

MACROCERAMUS HENDERSONI n. sp. Pl. 4, fig. 5.

The shell is perforate, conic-turritid, thin, the last 5 whorls corneous-brown, profusely and finely mottled with opaque white, with a series of irregular, lengthened brown spots at the periphery, showing above the suture on the spire; first $2\frac{1}{2}$ whorls blackish-brown, the next two dark, broadly maculate with white. Surface glossy, the first 4 whorls smooth, the rest closely and finely striate, the striæ low, as wide as their intervals, and very oblique. The spire is straightly conic, apex rather acute. Whorls 11, slightly convex, separated by a smooth suture, the last whorl well rounded peripherally and beneath. Aperture very oblique, ovate, marked with brown inside. Peristome expanded and reflexed, yellow or pale red. Columella brown, short, dilated, and having a rather strong but short fold above. Parietal callus transparent. The internal axis is slender and distinctly twisted spirally.

Length 19, diam. 9.5, length of aperture 8 mm.

Length 20, diam. 9.8, length of aperture 8 mm.

Length 18, diam. 9.5, length of aperture 8 mm.

Sierra de Cubitas, Camaguey, Cuba.

This species is very distinct from all others now known, differing from the *canimarensis* group by the total absence of a basal carina, and from the forms prevalent in Eastern Cuba by its thin texture, sculpture and coloration. It is one of the largest and finest of the Cuban species.

The coloration is very well shown in the figure. Besides the profuse and fine mottling with white there are occasional longitudinal white flames, bordered on the left side with dark, unmarked spaces.

CHONDROPOMA HENDERSONI n. sp. Pl. 4, fig. 6.

The shell is umbilicate, conic-turrite, narrowly truncate, rather solid. Last four whorls rather closely and subregularly marked

with slightly oblique stripes of red-brown, ochre, blue and white, the base red with white radial streaks; when whorls above the last four are retained they are scarlet with some white streaks.

The surface is glossy, with traces of fine, nearly effaced growth-striæ, and under close inspection some widely spaced lines may be seen, indicating periodicity in growth. Spiral sculpture consists of fine, distinct but low spiral threads, larger ones at intervals: 4, 5, or 6 smaller striæ between the larger; around the umbilicus the striæ are coarser, alternately larger, and latticed by the growth-striæ. Above the penultimate whorl the spirals are subequal. The spire is straightly conic, with 4 whorls below the tongue-shaped apical septum; but an empty whorl or more persists above the septum. The whorls are strongly convex, separated by a smooth, simple and deep suture, which close to the aperture descends a little more rapidly, the last whorl becoming free there for a short distance. The aperture is vertical, slightly longer than wide; the outer side more convex than the inner; reddish-brown inside. Peristome thin, the inner half nearly white, outer half brown-tinted; broadly reflexed throughout, a little retracted above and below, slightly produced in a short lobe above. Operculum unknown.

Length 25, diam. 15.5 mm.; aperture with perist. 12 mm. long.; 4 whorls remaining.

Length 27, diam. 15 mm.; aperture with perist. 12 mm. long., 5 whorls remaining.

Sierra del Ancón, northwest of Viñales, prov. Pinar del Rio, Cuba.

This magnificent species is related to *C. hamlini* var. *major* Crosse (Jour. de Conchyl., 1890, p. 300, pl. v, f. 6 a, b), but that is a far smaller shell, length about 17 mm., with chestnut-brown streaks extending upon the base. The figure in black and white gives a poor idea of the beautiful coloring of this shell, which is named in honor of my friend, John B. Henderson, Jr.

DESCRIPTIONS OF NEW CUBAN LAND SHELLS.

BY JOHN B. HENDERSON, JR.

HELICINA TORREI n. sp. Pl. 4, figs. 1, 2, 3.

The shell is depressed, very solid, the last whorl cream-white, gradually changing on the penultimate to sulphur-yellow, the color

of the spire. The surface is lusterless, with sculpture of strongly raised, rough spiral ridges parted by much wider concave intervals. On the last whorl there are 18 such ridges, stronger and more widely separated in the peripheral region. The intervals are obliquely roughly striate, and the wider ones above the periphery have also a few spiral threads. Six spiral ridges show on the penultimate whorl. They gradually become weaker on the spire. The embryonic whorl is rather large (2 mm. diam.), and smooth except for faint radial striæ. Whorls 4, rapidly widening, almost flat, the last whorl descends shortly to the aperture, and is convex beneath. Aperture large, flaring, strongly oblique, white with a trace of yellow within. The peristome is well expanded, thickened within some distance from the edge. There is a transverse tubercle at the junction of columella and basal lip. The axial callus is pure white, not very thick, spreading within nearly to the outer termination of the lip. Edge of parietal callus is very thin.

Alt. 15.5, diam. 26.5 mm.

Operculum calcareous, shining, bluish-white with iridescent lights, reddish on margins and densely covered with minute granules separated by species of about equal width.

Collected by T. Wayland Vaughan at Los Negros, 25 miles southeast of Bayamo in the province of Oriente, Cuba, in woods on low limestone hills.

This superb species I take pleasure in naming after Dr. Carlos de la Torre of Havana.

CEPOLIS ALAUDA CYMATIA n. subsp. Pl. 4, fig. 4.

The shell closely resembles *C. alauda avellanea* (Fér.) in texture and coloration, but differs by its more elevated, more conic spire, and by having a strong oblique crest behind the lip. Alt. 24, diam. 28 mm.; whorls $5\frac{1}{2}$.

Cuba; exact locality of the type unknown.

This well-marked variety, not uncommon in collections, appears hitherto to have escaped observation. I have no doubt that in a critical revision of the *Coryda* group this form will be given specific rank.

BIFIDARIA ARMIFERA SAY, AND ITS VARIETIES.

BY V. STERKI.

It has long been known that *B. armifera* is variable with respect to some of its features, but it seems that no attempt has been made to ascertain whether there are any real, tangible varieties. Careful examination of about 2,000 specimens from many places,¹ during the last few months, has proved that, after eliminating *B. clappi* as a distinct species, there are several well-marked varieties; with features which are of interest also in a general way.

B. armifera (Say) typical.² Shell more or less fusiform, decidedly short to rather elongate and slender, vitreous, colorless to very pale horn, or slightly milky-white; surface shining, with comparatively coarse, irregular striæ; whorls $6\frac{1}{2}$ –8, the average being about 7, the last somewhat rounded, keel-like, at the base, somewhat flattened over the palate, usually with a distinct, linear scar over the lower palatal plica; aperture rather large, rounded, peristome well everted, continuous, or its ends approximate, often with a connecting callus; inside the palate a rather strong, white callus into which the palatal plicæ merge; parieto-angular lamellæ rather large and long, distinctly complex, the angular connecting with the peristome, the spur³ of the parietal small but distinct; columellar massive, encircling the column, with an annex downward and inward; inferior columellar variable as to size, shape and position, sometimes a mere callus, often wanting; lower palatal plica regular, rather long, stout, upper palatal much shorter and smaller; suprapalatal distinct or slight or wanting; an interpalatal is not infrequent.

Alt. 3.5–5, average 4–4.5, diam. 2.2–2.5 mm.

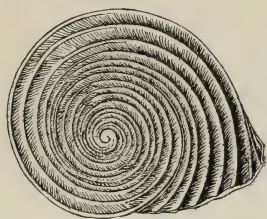
Distributed over the whole area covered by the species.

B. a. interpres, n. var. Near the typical form, generally somewhat slender; inferior columellar lam. rather high up, the base is narrow inside and more keel-like outside; the aperture is narrowly rounded at the base, and from this feature specimens are easily recognized. More than any other form this shows clearly that the so-called "basal" is really an inferior columellar.

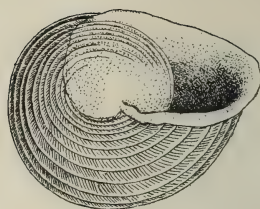
¹ There are 160 entries in my collection of *B. armifera* and varieties, and many others were received for examination.

² Dr. Pilsbry had the kindness to look up Say's original specimens in the collection of the Phila. Acad., and wrote me that they are of this form.

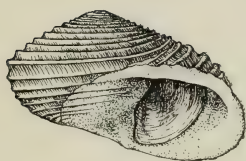
³ See THE NAUTILUS, XXII, p. 108, foot-note.



1



2



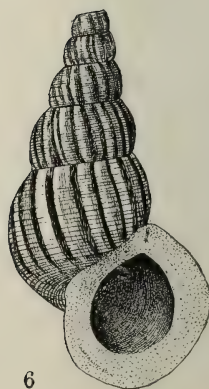
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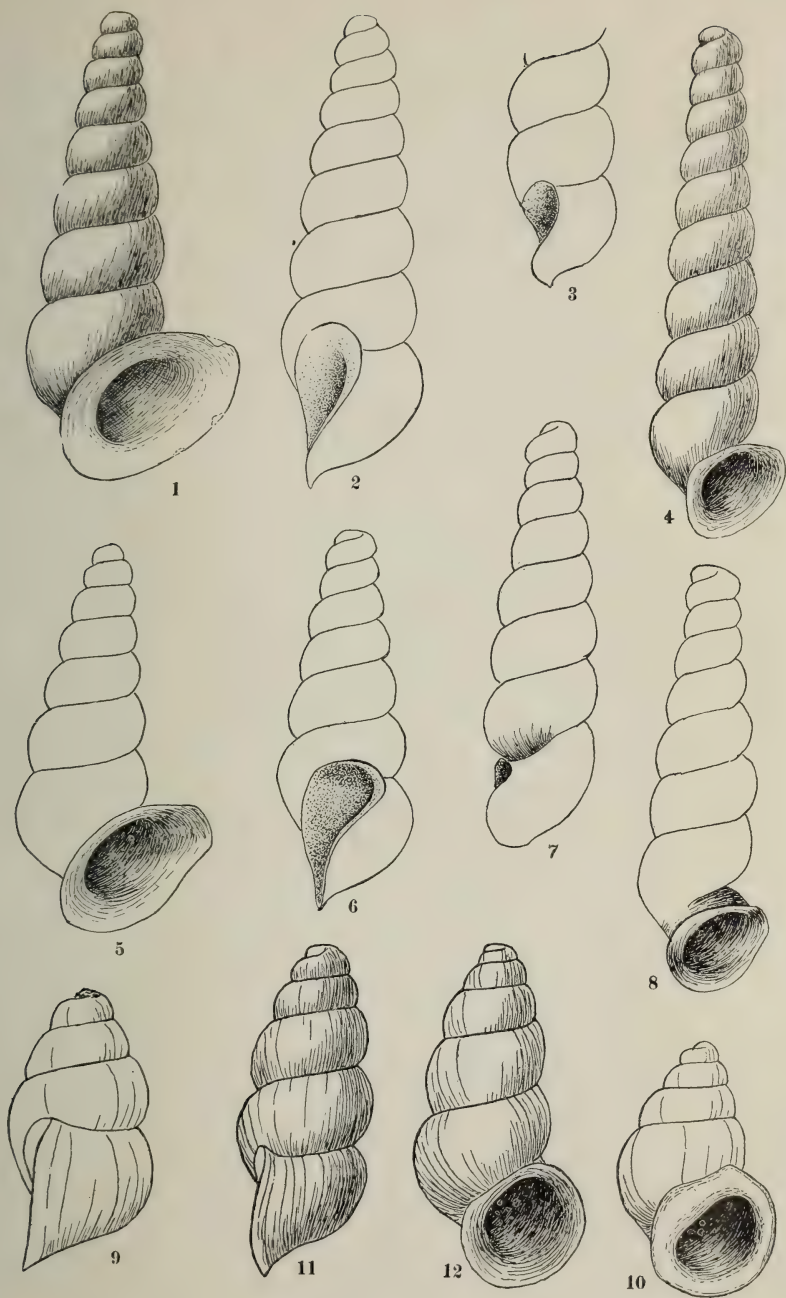
4



5



6



EMMERICIA AND PTERIDES.

Distribution: Southern, especially southwestern; it appears to be the prevalent form in Kansas, Arkansas, Oklahoma, and thus represents a geographical variety.

B. a. similis, n. var. Averaging somewhat smaller; more cylindrical, often more or less conical; whorls less convex; surface striæ slighter; shell generally more milky-whitish, as noticed especially when a number of each, *armifera* and *similis*, are placed side by side; peristome never continuous, somewhat less everted; the columellar lam. is slighter, generally more protracted downward, the lower palatal is shorter, sometimes quite short; the spur of the parietal is larger.

Distribution; Northern New York to Iowa, Minnesota, Ontario.

B. a. affinis, n. var. Somewhat small and slight; near *similis*, but less cylindrical, rather somewhat oblong; whorls $6-6\frac{1}{2}$, somewhat more convex than in *similis*, the last rounded at the base and little flattened over the palate, with none or a slight scar over the lower palatal plica; aperture somewhat rounded, peristome never continuous; parieto-angular lam. well connected with the peristome, spur of the parietal larger than in typical *armifera*; columellar nearly axial, a broad lamella, reaching down to the base, with distinct lines of growth, visible from the outside through the (fresh) shell below the umbilicus, as in *B. contracta*; inferior columellar wanting or small; lower palatal quite short, or even a transverse, short, abrupt lamella.

Alt. 3.5-4, diam. 2.2-3 mm.

Distribution: Northern Ohio, Michigan, Indiana to Minnesota and Kansas; seems rather scarce in the first-named States, common in Kansas. Found, *e. g.*, on sandy dunes on Lake Erie in Ohio.

It is notable and significant that both the columellar and the lower palatal in this form are of the same shape as in *B. contracta*, while in typical *armifera* they are quite different, yet the latter shows a tendency to having the peristome continuous, while in *affinis* its ends are always apart.

B. a. abbreviata, n. var. Averaging rather small, slight, somewhat fusiform to ovate or cylindro-conical; apex low, conical or rounded; whorls only $5\frac{1}{2}-6$ (rarely $6\frac{1}{2}$), little convex, with the penultimate comparatively broader than in the other forms, the last rounded at the base, slightly flattened over the palate; color somewhat milky-whitish; surface with a dullish gloss, striæ fine and slight; aperture somewhat small; peristome moderately everted, its ends (in

most forms) comparatively far apart; lamellæ and plicæ: parieto-angular not or slightly connecting with the peristome, spur small; columellar rather as in typical *armifera*, but smaller, slighter; inferior columellar tooth-like, placed obliquely, more constant than in other forms as to size, shape and position; lower palatal regular but slight, often rather short; suprapalatal rather constant.

Alt. 3.3–3.8, rarely 4–4.2, diam. 1.9–2.2 mm.; some specimens are low, almost globular, *e. g.*, alt. 3.2, diam. 2.1 mm.

Numerous specimens seen from Bismarck, N. D.; Eastport, Ia. (Missouri River drift); Lincoln, Neb.; Nickerson, Kans.

As *B. a. ruidosensis*, Prof. T. D. A. Cockerell¹ has denoted a form from New Mexico: "Shell only 4 mm. long, with the two outer teeth a considerable distance within the aperture." The description is somewhat meagre, but the variety may stand on its merits. There are, however, specimens from various places of New Mexico with the lower palatal plica rather short and rather remote from the margin, the columellar rather simple and comparatively small; alt. 3.8–4.2 mm.; they may be of *ruidosensis*.

The interrelations of these forms will be discussed elsewhere, and figures given.

B. armifera appeared to be rather well known, being the largest of the genus, fairly common over a wide territory, and probably the one best represented in collections. Yet a closer study of its forms has shown some interesting facts with respect to morphology, phylogeny and distribution. As Mr. Clapp expressed it, with a view to this variation and the externally similar *B. clappi*: "We can no longer say that a *Bifidaria* is simply *armifera* because it is big and white."

MORE NOTES ON THE FAMILY PYRAMIDELLIDÆ.

BY PAUL BARTSCH, M. S., PH. D.

In the "American Journal of Science" for June, 1909, pp. 475–484, Dr. K. J. Bush reviews my paper on the "Pyramidellidæ of New England and the Adjacent Region," and discusses in a general

¹ THE NAUTILUS, XIII, p. 36. The specimen referred to is not at hand, and I cannot remember exactly what it was. The type is in coll. Acad. Nat. Sciences.

way a number of other papers upon the same group published by Dr. Dall and myself, as well as some of her own and of Prof. Verrill's works upon the family.

In this contribution quite a number of facts are presented, which are at variance with the data at my disposal. I am forced to publish the following notes in order that there may be no misunderstanding.

It is a great pity that Dr. Bush did not publish the manuscript she prepared in 1896. As it is, the MS. names have no standing and cannot enter into the discussion of the present work.

I was not aware that Dr. Bush was working upon this group at the time I prepared my manuscript, her last publication upon it having appeared nine years ago, nor was I aware that Dr. Bush had seen Mr. Winkley's material, which was incorporated in my report, as was implied in her review. I wish likewise to disclaim any intended discourtesy in not acknowledging Dr. Bush's work in my introduction, for I considered both of her papers as extralimital. The one dealt with Carolinian, Floridian, West Indian and South American species (with a reference to *Turbonilla interrupta* Totten); the other with Bermudan forms.

The matter of classification is so fully discussed in the monograph on the West American Pyramidellidæ by Dr. Dall and myself now going through the press, that I shall not refer to any of the statements concerning it here, but will refer any one interested in the subject to the forthcoming volume. I will say, however, that *Pyrgostelis* (which has no standing) was never used by us, Dr. Bush notwithstanding, and that *Triptychus* and *Peristichia* are Pyramidellid; they have a sinistral nucleus and columellar folds, the family characters of the group. Here also I may say that Dr. Bush is in error when she states that Dr. Dall and myself furnished the text on the mollusks in Dr. Arnold's paper on the Paleontology and Stratigraphy of the marine Pliocene and Pleistocene of California: Mem. Cal. Acad., III, 1903. We contributed only that part which deals with the Pyramidellidæ.

I believe that all of the present differences of opinion could have been avoided if Dr. Verrill had yielded to my request and had sent me specimens of what he considered typical representatives of some of the older species as well as some of those described by himself. All of the early collections of northeastern American marine

invertebrates were placed in Professor Verrill's charge by the U. S. Bureau of Fisheries for report, and have been in his care until very recently, when most of them were returned to the custody of the U. S. National Museum. It would seem only natural that I should have had specimens for comparison; first, because they represented government material *reported upon*, and, secondly, because when Miss Bush was at work upon her southern report, Dr. Dall furnished her with cotypes and authentic material as requested, and as duly acknowledged in her report.

I neither had nor have any desire to enter into a controversy with any one concerning these old species, the original descriptions of which in some instances are so poor that it is scarcely possible to refer them to the proper subgenus, and which in most cases might be applied to almost any member of a subgenus. No types are extant, some having been burned in the Chicago and Portland fires and others lost.

There is only one of two ways open in dealing with such names, viz., to place them as "*sedes incertae*," or to fix them to some known species. The latter method was adopted by Prof. Verrill, and I attempted as far as it was in my power to follow his dictum, the only logical method under the circumstances.

The subgenus *Eulimella* will have to be dropped from our New England list, now that Dr. Bush has been able to show that the two specimens identified by Prof. Verrill as *Eulimella ventricosa* Forbes, are *Turbonilla* (*Ptycheulimella*) *polita* (Verrill) and *Aclis tenuis* Verrill. I have seen no specimens of *Eulimella* from New England, and quoted it on Dr. Verrill's authority as stated.

Pyramidella (*Syrnola*) *smithii* Verrill has only a single fold on the columella, hence is a *Syrnola*; not a *Eulimella*, which has two folds.

I have seen C. B. Adams' types at Amherst College, and feel no need of changing my statement regarding *Pyramidella* (*Syrnola*) *fusca* and *producta*. I agree with Dr. Bush that they are not typical *Syrnolas*; that is why I placed the ? after *Syrnola*. It is quite probable that these two species and *S.?* *winkleyi* may belong to a new group, but I have refrained from giving it a name until some knowledge of the animal might be obtained. These are by no means *Odostomias*, but are nearest to if not exactly congeneric with *Syrnola*.

My *Turbonilla* (*Turbonilla*) *nivea* Stimpson, was an acceptance of Professor Verrill's interpretation of that species. The specimen listed

as cat. no. 45481 U. S. N. M., from station 949, off Martha's Vineyard, 1881, was determined by him, and the others which I listed, were carefully compared with it and was found absolutely conspecific.

As to *Turbonilla* (*Turbonilla*) *striata* Verrill, I must again say that I followed Prof. Verrill's dictum; the 15 specimens listed as cat. no. 62340 U. S. N. M., from Naushon gutters, 1883, were determined by him, like the 11 entered under cat. no. 203815 U. S. N. M., from Naushon, 1883, the two last being part of the material recently returned, and the other two lots listed are absolutely conspecific with these. I am therefore at a loss to understand how I could possibly have erred in the interpretation of the species.

I have no additional data concerning *Turbonilla* (*Chemnitzia*) *æqualis* Say.

Turbonilla (*Strioturbonilla*) *bushiana* Verrill, will have to remain in this subgenus. It falls well within Sacco's definition: "Testa sicut in TURBONILLA (stricto sensu), sed transversim striolæ parvillimæ (sub lente vix visibiles) plerumque tantum in spatiis intercostalibus, interdum etiam supra costas decurrentes saepe suboblitæ. Costæ longitudinales basim versus gradatim evanescentes. Costicilla circumbasalis nulla. Testæ basis subrotunda."

Page 481. I shall reserve my judgment regarding *Turbonilla* (*Pyrgiscus*) *areolata* Verrill, until I have had the opportunity to make comparisons with the type. I may say, however, that the affinity of our specimens are not with *Turbonilla* (*Pyrgiscus*) *vinæ*, as suggested by Dr. Bush, but with *Turbonilla* (*Pyrgiscus*) *elegans* Verrill.

The most interesting part of the whole review comes under the head "*Turbonilla interrupta* (Totten) Bush, 1899, pp. 148-151."

Of this species Dr. Bush gives her own interpretation, and emphasises her opinion with a figure of what she considers the true "*interrupta* Totten"—stating that "the specimen described (p. 87), and figured by Bartsch, unfortunately does not agree with this, therefore I would distinguish it as *Turbonilla pseudointerrupta*, new name."

There is only one fault with Dr. Bush's deductions, namely, that our figure and description were based upon the same individual which has served for her figure of typical *interrupta*. The figured specimen from Sta. 770, Narragansett Bay, in 8 fms., dredged in 1880, is now entered under cat. no. 202889 U. S. N. M. It came to us in

1907, when a large part of the Bureau of Fisheries collection in Dr. Verrill's charge was turned over to the U. S. National Museum, and bears the legend, "Sta. 770, Figured, *T. interrupta* Totten," in Dr. Bush's handwriting. The name *Turbonilla pseudointerrupta* Bush, is therefore superfluous.

Dr. Bush states that *Odostomia bushiana* Bartsch, is preoccupied by *Odostomia bushiana* Jeffreys, 1884. I have been unable to find any such name. The only reference to *bushiana* by Jeffries in 1884, that I know, is to *Turbonilla bushiana* Verrill.

I am not in position to give any opinion upon what Dr. Bush's young shell from Woods Holl may be, but I do know that our shell is an *Odostomia* belonging to the subgenus *Iolæa*. *Iolæa*, like *Menestho*, from which it is distinguished by having an umbilicus, is quite variable in its strength of sculpture. *Odostomia (Iolæa) hendersoni* Bartsch, is neither the *type species* nor the norm, of *Iolæa*, but comes well within its definition. It does not belong to the same family to which *Aclis* belongs.

A single specimen of *Phasianella sulcosa* Mighels, was found by Mighels in Casco Bay. It was described in 1843, Bost. Journ. Nat. Hist., IV, p. 358, Pl. XVI, f. 4, and later doubtfully referred to *Rissoella* by Stimpson. It is quite probable that it really belongs to *Menestho*, the subgenus of *Odostomia*, which it resembles in sculpture, but no plication is shown or mentioned on the columella, and nothing is said of the nucleus. The lack of positive data concerning these characters kept me from referring it to the Pyramidellidæ.

I would be pleased to know upon what grounds Dr. Bush bases her contention of the synonymy of *Phasianella sulcosa* Mighels, and *Odostomia (Menestho) sulcata* Verrill; for Mighels' description and figure are entirely different from Professor Verrill's description, and Dr. Bush's figure of *Odostomia (Menestho) sulcata* Verrill.

Phasianella sulcosa Mighels, is represented much more inflated than *Odostomia (Menestho) sulcata* Verrill. *P. sulcosa* Mighels, has three incised spiral grooves between the sutures on each whorl, and three or four on the base, while *Odostomia (Menestho) sulcata* Verrill is represented as having five spiral grooves between the sutures and nine upon the base. A glance at the two figures alone is enough to convince one that they are not at all specifically related, and this deduction is verified by the description. I do not believe that the author of the latter species would agree to have his species put under

the synonymy of Mighels' *Phasianella sulcosa*. Under these circumstances, *Odostomia* (*Menestho*) *morseana* will have to do duty as stated in my text, p. 104.

I object emphatically to the lumping of *Odostomia bisuturalis* Say and *O. trifida* Totten. In the 1700 and more specimens that I have seen, I have no difficulty whatever in distinguishing them. It is true that *trifida* sometimes has the three suprasutural grooves poorly developed, but I have never seen them completely absent, as is the case with *bisuturalis*.

I also deny that there is any special relationship between *Odostomia* (*Menestho*) *bedequensis* and *Odostomia* (*Menestho*) *impressa* Say. The relationship of *Odostomia* (*Menestho*) *trifida* and *Odostomia* (*Menestho*) *trifida bedequensis* I believe is parallel to that between *O. (M.) bisuturalis* and *O. (M.) bisuturalis ovilensis*.

Dr. Bush questions whether I intended to use the word "spiral" in the fourth line of my description of *Odostomia* (*Menestho*) *impressa* Say. I did. "Spiral" is correct.

The specimen described and figured by me as *Odostomia* (*Odostomia*) *modesta* Stimpson, will have to be cited as *Odostomia* (*Odostomia*) *gibbosa* Bush.

Dr. Bush states (p. 482, last paragraph), "that the shell which is referred to *Odostomia* (*Odostomia*) *dealbata* Stimpson," is not the same as fig. 595, given in Binney-Gould, p. 327;" of the latter she says: "This, as indicated in a marginal note, represents a much larger and different species, which may be called *O. gouldii*, new name." Unfortunately, the name *Odostomia gouldii* was used by Dr. Carpenter in 1865, Ann. Mag. Nat. Hist., 3rd ser., XV., p. 30, for a West American species, and can therefore not serve in the present instance.

Summing up Dr. Bush's review I must say that nearly all the questions raised in it could have been settled better by correspondence than by discussion in print. It is somewhat unfortunate that Dr. Bush should not have published her paper written thirteen years ago, but I cannot see how this can now be helped. I have given all my spare time to this group since 1897, and hope, now that the West Coast is cleared up, to consider the Atlantic side of America.

The field is much larger than any one, who has given it less attention, would imagine. My card catalogue of described forms contains somewhere between 2,500 and 3,000 names, including recent and fossil species.

NOTES.

VIVIPARUS IN PHILADELPHIA.—A find which may be of interest to readers of the NAUTILUS was made by the undersigned a few weeks ago near Horticultural Hall in Fairmount Park. The species was *Viviparus contectus* (Mill.). It has not before been reported from Philadelphia, and as far as I know not from the State. The females were larger than the males and outnumbered them. Most of the adult females were pregnant. The sex was determined in 14 males and 39 females. In 18 specimens it could not be determined readily. The specimens are in my own collection and that of the Academy of Natural Sciences. The lily pond in which they were collected had just been restocked with plants, and Mr. Pilsbry, to whom I owe the identification, suggested that the snails had been introduced on the plants. Two years ago they were unknown in the same pond.—JOSHUA T. BAILY, JR.

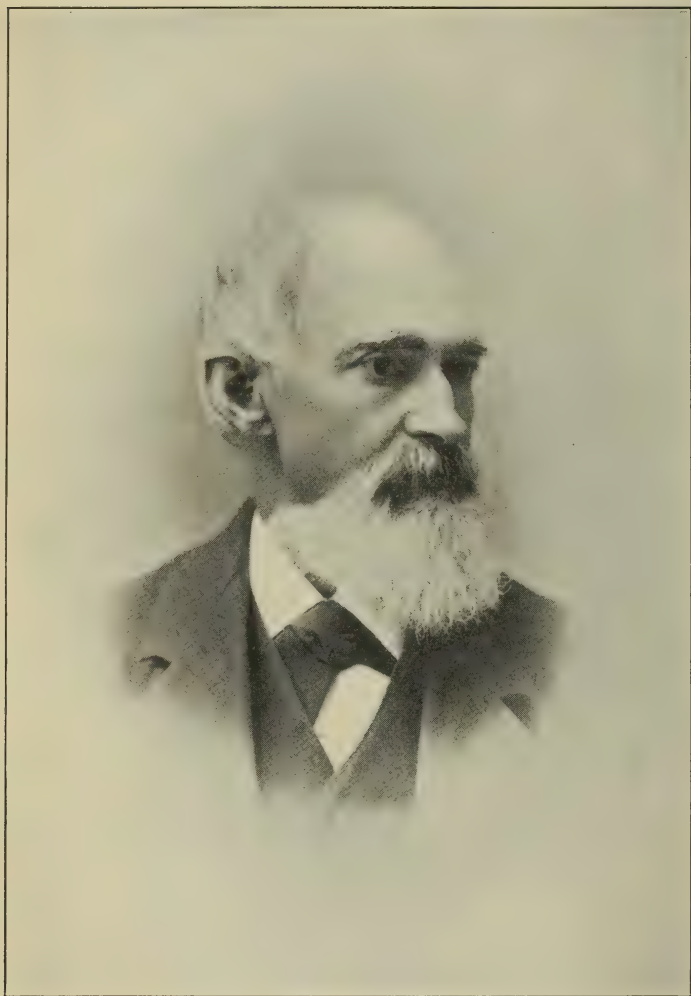
We have to announce the death, July 28th, at Los Angeles, Cal., of Dr. R. E. C. Stearns, in his 82d year. Also, of Mr. William G. Binney, on July 25th, at his home, 222 East Union St., Burlington, N. J.

PUBLICATIONS RECEIVED.

A PRELIMINARY LIST OF THE UNIONIDÆ OF WESTERN PENNSYLVANIA, WITH NEW LOCALITIES FOR SPECIES FROM EASTERN PENNSYLVANIA. By DR. A. E. ORTMANN (Annals of the Carnegie Museum, Vol. V, pp. 178–210, 1909). An interesting review on the geographical distribution of the *Unionidæ* in Pennsylvania. Some 46 species are recorded from the Ohio River drainage, 17 from the Lake Erie drainage, and 14 from the Atlantic drainage.

THE DESTRUCTION OF THE FRESH-WATER FAUNA IN WESTERN PENNSYLVANIA. By DR. A. E. ORTMANN (Proc. Amer. Phil. Soc., Vol. 48, pp. 90–110, 1909). A paper of general interest to all zoologists, showing clearly with the aid of a map the great changes which have taken place in comparatively few years. Situated in the great oil and coal region, this section has suffered more than areas where the streams are only polluted by the sewage of the large towns and cities.

SHELLS OF MAINE, A CATALOGUE OF THE LAND, FRESH-WATER AND MARINE SHELLS OF MAINE. By NORMAN WALLACE LERMOND. An up-to-date list of the shells of Maine, containing 403 species and 38 varieties, with the principal synonymy and their distribution. The introduction contains a review of the work done by previous authors and others. Privately printed by the author at Thomaston, Maine.



DR. R. E. C. STEARNS

THE NAUTILUS.

VOL. XXIII.

OCTOBER, 1909.

No. 5

A NEW BELA FROM FRENCHMAN'S BAY, MAINE.

BY KATHARINE J. BUSH, PH. D.

BELA BLANEYI, sp. nov. Fig. 1.

Type locality—South of Egg Rock buoy in about 30 fathoms mud and gravel, Frenchman's Bay, Maine.

Two dead specimens dredged by Mr. Blaney were recently sent me for identification. They are of especial interest as they prove to be unlike any species hitherto known from the American waters. The only one which they at all resemble is the *Bela incisula* Verrill (Transactions of the Connecticut Academy of Arts and Sciences, vol. V, p. 461, pl. xliii, fig. 12 and pl. lvii, fig. 14, 1882).

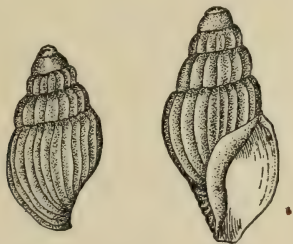


FIG. 1. *BELA BLANEYI*.

They differ from that species in having more elongated whorls and therefore appear more slender. The ribs are very little raised and are indicated rather by the deepened interspaces than by being raised above the general surface level along the shoulder which is roundly angulated; on some portions of the whorls these ribs blend entirely

with the sinuous lines of growth. The smaller specimen of four (4) whorls is destitute of spiral lines, either raised or incised, but the larger one of five (5) whorls has about fifteen (15) very faint incised spiral lines on the body whorl commencing well below the shoulder and are so shallow as to scarcely interrupt the otherwise smooth surface; there are also occasional faint indications of one or two spirals just above the suture on the preceding whorl. The one and one-half (1.5) nuclear whorls are well rounded and apparently smooth (this may be due to erosion) and regularly coiled. The epidermal layer has a delicate yellow tint.

The larger specimen measures 7 mm. in length by 3.5 mm. in width. The smaller, 5.5 mm. in length by 3 mm. in width.

I take much pleasure in naming the species in the honor of Mr. and Mrs. Dwight Blaney, of Boston, Mass., and Ironbound Island, Maine who have long been enthusiastic collectors and students of New England mollusks and have added much to our knowledge of the fauna.

Yale University, September, 1909.

LIST OF SHELLS FROM FRENCHMAN'S BAY, MAINE.

BY DWIGHT BLANEY.

The following list of additions to the shell-bearing Mollusks of Frenchman's Bay, is supplementary to the lists published in 1904 and 1906. (Proc. Bost. Soc. Nat. Hist., Vol. 32, No. 2, pp. 23-41, and NAUTILUS, Vol. XIX, No. 10, p. 110). The writer is indebted to Dr. K. J. Bush and Mr. C. W. Johnson for the identification of the various species.

Leda caudata, Lovén. One fine specimen.

Odostomia sulcosa (Mighels) = *O. sulcata* Verrill. (See K. J. Bush, Am. Journal Sci., Vol. XXVII, p. 475, 1909.)

We have dredged 20 specimens of this interesting species, the largest being 4 mm. long. Some with the distinct upturned nucleus most perfect.

Odostomia dealbata (Stimp.) Six specimens.

Bela decussata var. *pusilla* Verrill. (Trans. Conn. Acad. Vol. V, 1882, p. 481). A fine series dredged off Egg Rock.

NOTE.—Among our large series of *B. incisula* V., we have found

considerable variation in the longitudinal sculpture, and have been able to arrange good series of a form *without any* longitudinal ribs, which seems worthy of being a good variety; we have also arranged a good series of an intermediate form showing numerous ribs which grade into the typical form as described and figured by Prof. Verrill. (Trans. Conn. Acad., Vol. V, p. 461, pl. xliii, fig. 12.) We have good examples of the very young of all three forms, showing the sub-nucular whorls forming the characteristic sculpture.

Bela blaneyi Bush. Two specimens, one immature and one adult, (see previous article).

Philine lima (Brown) = *P. lineolata* Stimp. Two specimens dredged off Egg Rock, one alive.

Retusa obtusa Montg. var. *turrita* Möller. Six specimens.

NOTE.—We have been able this season to dredge fine specimens, both valves, of *Pecten islandicus* (Müller.), *Serripes grænlandicus* (Gmelin), *Panomya norvegica* (Spengler), *Cyrtodaria siliqua* (Chem.), and *Cochlodesma leanum* (Conrad). Of all of which we had previously dredged only single valves.

A NEW LAND SHELL FROM BERMUDA.

BY H. A. PILSBRY AND E. G. VANATTA.

ZONITOIDES BERMUDENSIS n. sp. Fig. 1a, b, c, d.

The shell is broadly umbilicate, much depressed, with low convex spire and rounded periphery, glossy, yellow. First $1\frac{1}{2}$ whorls corneous, smooth, the rest distinctly, rather irregularly striate, the base a little smoother. Under the compound microscope very faint traces of minute spiral striæ may be seen, chiefly on the upper surface. Whorls $5\frac{1}{4}$, convex, slowly increasing, the last less convex below than in the peripheral region; the umbilicus perspective, broadly open, one-third the total diameter of the shell. Aperture lunate, wider than high, but not much wider than the umbilicus.

Alt. 2.3, diam. 5.7 mm.; width of umbilicus 1.8, aperture 2 mm.

Church Cave, near Tuckers' Town, Bermuda. Types no. 91,152, A. N. S. P., collected by Mr. Stewardson Brown, 1905 and 1909.

This species has more whorls and a smaller apex than *Z. excavata* (Bean), it is more depressed, the last whorl is less convex beneath, and the umbilicus is larger. *Z. arborea* (Say) has invariably a

much smaller umbilicus than the Bermudian species, which is more depressed than *Z. nitida*, with a more open and perspective umbilicus.

This shell is abundant at the place mentioned, where it is associated with numerous other land shells, most of them native species. We have been unable to find any foreign species to which this may be referred. It seems to be indigenous. The generic reference has been verified by examination of the dentition, which has teeth of the type usual in *Zonitoides*. There are 6 lateral and about 17 marginal teeth (fig. 1d). The jaw is smooth, with a low median projection (fig. 1c). We found no dart in the two dried specimens examined, but this may have been due to their condition.

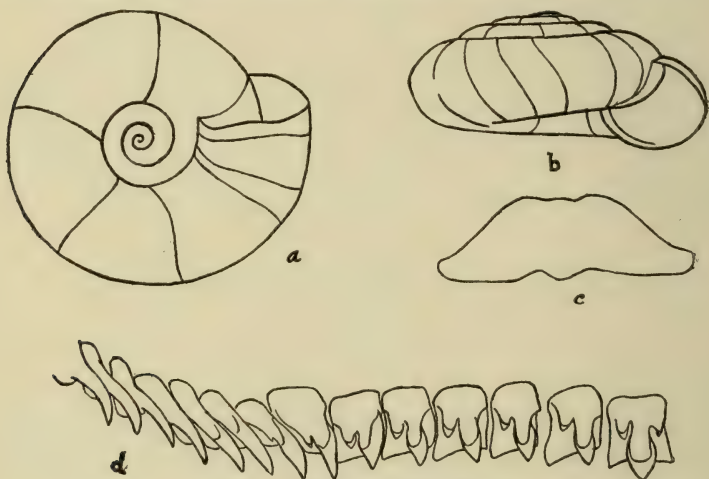


FIG. 1. *Zonitoides bermudensis*.

KALIELLA TURBINATA (Gulick).

Euconulus turbinatus Gulick, Proc. A. N. S. Phila., 1904, p. 420, pl. 36, figs. 8, 9, 10.

This species is abundant at Church Cave. An examination of the radula shows it to be a typical *Kaliella*. It resembles the Indian *K. fastigiata* (Hutton), but is distinct from that and all other known Indian species, according to Lieut.-Col. Godwin Austen, who kindly compared specimens with his great series of oriental species.

K. turbinata was described from sub-fossil examples from the lime-rock quarries. It is therefore not a recent importation; yet the presence of this oriental genus in Bermuda can hardly be accounted for except by the supposition of introduction with plants during the period of human occupation.

A NEW RISSOA FROM BERMUDA.

BY E. G. VANATTA.

RISSOA (NODULUS) STEWARDSONI, n. sp. Fig 1.

The shell is very minute, slightly rimate, thin, pale yellowish corneous, smooth, slender, regularly tapering from the last whorl to the very obtuse summit. Whorls $4\frac{1}{2}$, moderately convex. Aperture semi-rotund, subvertical, the peristome continuous, inner margin nearly straight, the outer regularly curved. Length 1.5, diam. 6.5, length aperture .55 mm.

Types No. 99041, A. N. S. P., from Fairyland, near Hamilton, Bermuda, near the shore, collected by Mr. Stewardson Brown, associated with *Melampus coffea* and *flavus*, *Leuconia occidentalis* Pfr., *Blauneria*, *Alexia*, *Detracia*, *Pedipes*, *Carychium*, *Cæcilioides*, *Bifidaria*, *Thysanophora*, *Polygyra microdonta*, and many other land shells.



FIG. 1.



FIG. 2.

This tiny snail has the appearance of the terrestrial genus *Acme*. It is apparently a shore shell, as it was not found with any typically marine forms. It seems to be most closely related to the Mediterranean and Adriatic *R. epidaurica* Brusina, from which it differs by the more slender contour, more tapering spire and more convex whorls. *R. epidaurica* is decidedly more cylindrical. For comparison a figure is given (fig. 2) of a specimen of *R. epidaurica* received from Professor Brusina, from Ragusa, Dalmatia (No. 59,898 A. N. S. P.) *R. glabrata* Muhlfr. is more conical than *stewardsoni*, with the aperture more rounded.

DESCRIPTIONS OF TWO NEW SPECIES OF MUSCULIUM.

BY V. STERKI.

MUSCULIUM WINKLEYI, n. sp.

Mussel slightly inequipartite, high, well and regularly inflated, outlines along the valve edges well rounded to subcircular; posterior part higher and somewhat larger than the anterior, often subtruncate and with a slight postero-inferior angle; beaks little anterior, rather narrow, calyculate or plain, prominent; somewhat inclined towards the anterior; surface distinctly rugulose, dullish or somewhat shining, with comparatively coarse, sharp, subregular, crowded concentric striæ and some faint, shallow, irregular radial striæ; color horn to grayish or reddish, with one to a few narrow, darker zones along the lines of growth, straw to light yellowish in the young, and in marginal zones becoming obsolete in old specimens; shell thin, subtranslucent to opaque, hinge well curved, slight, cardinal teeth small, thin, laterals with short cusps; ligament rather short, covered; scutum and scutellum slightly but distinctly marked, rather long.

Long. 8.5, alt. 7.8, diam. 5.4 mm.

Soft parts not examined.

Habitat: Old Orchard, Me.; vicinity of Danvers, Mass.

M. winkleyi is not a variety or local form of some other species, but markedly different and decidedly distinct. It has some resemblance to forms of *M. securis* Pr., but is higher, with more rounded outlines, the hinge margin is more curved, the difference of size and shape between the anterior and posterior parts is less marked; in *securis* the posterior part is more truncate and less obliquely so to the dorso-ventral line. All these differences are especially well marked in half-grown specimens.

It is somewhat variable: some specimens seen (years ago) from Old Orchard were 10 and 10.5 mm. long; those seen from Danvers are somewhat smaller and sligher, with sligher surface striæ, some of them of a little more angular outlines posteriorly.

The type lot is No. 1396 of my collection of *Sphæriidæ*,¹ from Old Orchard, Me.,² collected and sent in 1896 by the Rev. H. W. Wink-

¹ Now of the Carnegie Museum.

² There is no doubt that specimens from the same place are in various other collections as *M. securis cardissum* or as " ?."

ley, in whose honor the species is named, and who has collected specimens of all stages of growth at various places in the vicinity of Danvers (Nos. 5343, 5355, 5356).

MUSCULIUM PARVUM, n. sp.

Shell small, inequipartite, oblique, medium inflated; margins generally rounded, or with a slightly marked angle at the junction of the superior margin with the obliquely subtruncate posterior; anterior part of the mussel much smaller than the posterior; beak somewhat anterior, little prominent, broad, calyculate or plain (form *æstivalis*); surface shining, with slight, irregular striæ; shell very thin and fragile, transparent to translucent, colorless to pale corneous; hinge very slight, cardinal teeth nearly straight longitudinally, the left posterior above the anterior, which is strongly curved up.

Soft parts colorless (except for the tan of the liver), also the siphons and mantle edges; siphons short, very shortly connected when extended, the branchial wide; foot strongly folded at the sole, when emerging.¹

Long. 4.7, alt. 4, diam. 2.8 mill. (average).

Habitat: Ohio; a swamp near Uhrichsville; also in Stark and Summit Counties, collected by the writer, 1906-'09. Types no. 5408 of my collection of *Sphæriidæ*.

The first specimens were doubtfully ranged under *M. securis* Pr.; but with the latest ones, and their soft parts, it became evident that they are distinct; they are smaller, the superior margin is less curved, the posterior is more rounded and more oblique, the surface shining, the shell colorless, while in *securis* it is generally yellow; the siphons are much shorter and very shortly connected, colorless; in *securis* they are yellow to orange or salmon or reddish.—*M. sphæricum* Anth., so far as known,² is larger, the beaks are narrow and much more prominent.

¹ This may not be a specific feature.

² The two specimens (four loose valves, the third in the lot is a young *Sphærium occidentale* Pr.), in the T. Prime collection, No. 10 (conf. 1895 catalogue) and ranged under *securis*, are hardly sufficient for establishing a species; the one in the National Museum, No. 11612, is rather different; in the Anthony collection no specimens were found.

ON COLLECTING.

BY REV. HENRY W. WINKLEY.

“I wish I had my life to live over again” is a frequent expression. The writer has no such desire, but I could have done better work formerly if I had had the experience, and I wish I could give my experience to others.

Dr. Sterki has in a recent article in the NAUTILUS, mentioned some methods of work. A visit from that veteran worker a few months ago was of great help to me. As a result I have collected more materials this year than I have in any half-dozen years formerly. My outfit is simple. Rubber boots, a net of scrim, frame of steel wire so made that there is one foot straight as a scaping surface, a bamboo pole in two joints. A large sieve of fine grain, small bags of kakki and one or two jars. All can be carried on a bicycle. With this outfit I have gone from my home on trips lasting from one to two hours, and returned with from one to two thousand specimens of *Pisidium*, *Planorbis*, *Amnicola*, etc. The same outfit serves for much of the marine work. The importance of “when you’re gittin, git” is realized when one returns with one or two thousand specimens and finds two or three very rare forms among them. Mud is my delight in fresh or salt water. It is swarming with life. Eel grass is another rich field. Dip and sift dry and examine with a lens; the tiny chaps are easily overlooked.

Our work is a labor of love, many of our best collectors have limited means, often limited time. Though the writer has at times employed a sail boat for dredging, and results have been excellent, all the new species turned up in New England during the last twenty years, have been obtained either by trips on foot or from a row boat. It requires hard work to dredge from a row boat, but it can be done. Rare species of *Pyramidellidae* have all been obtained in that way, but don’t be afraid of mud. A list of Prince Edwards Island species, some new—others not before known in Canadian waters has proved a valuable contribution. I never was anywhere near that island. The materials all came from mud washed from the oyster shells, miles away from their home. At present the writer is busy with marine mud in a sheltered bay. Reports will come later, but rare forms with one species that may prove new, are already before me. New England needs more workers, and it is full of surprises, espe-

cially when one considers how much can be found with a simple outfit, and a few ounces of energy. No doubt the same is true of the whole country. A person once said to the writer "your hobby is the most fascinating I know. Every one admires shells." Perfectly true, but far too many are afraid of mud. I don't know of any success without a bit of the disagreeable work.

THE LAND MOLLUSCA OF ALDABRA.

BY MAXWELL SMITH.

Mr. E. Dupont, who is now residing at Hell Bourg, Reunion, has been fortunate in obtaining specimens and information of this group. The Aldabra Islands are situated in the Indian Ocean to the north of Madagascar and between the Conoro and Mascarene groups. Not many years ago the land mollusca of Aldabra were unknown, in fact not a single species had been recorded from the islands. Mr. Dupont writes me as follows. Aldabra was visited by an American, Dr. W. L. Abbott, in 1892, who published an account of the birds in the Proceedings of the U. S. National Museum for 1895.

The island was visited by a German, Dr. Vodtykon in 1895, accounts of which were published. I do not think that these mention land shells. In September, 1906 my cousin, Mr. R. Dupont, Curator of the Botanical Station at Victoria, Mahe, Seychelles, investigated these islands on behalf of the Seychelles government. He collected the shells which I now send to you.

At last, quite recently an English naturalist, Mr. Fryers, has been staying there during several months; to complete the geological observations made by Prof. Sardina, on the separation of the islands in the Indian Ocean.

So now the natural productions of this island, which was for long a terra incognita, will now be fairly known. Judging from the shells, it has more affinities with the Comoro Islands than with the Mascarene.

The shells known are as follows:

Ennea sp. Grande Terre. The Picard. Iles Vertes. Closely allied to the common *E. dentiens*. May prove to be new.

Kaliella aldabraensis, n. sp. To be described by Col. Godwin Austin.

Rachis aldabræ Mart. A beautiful shell of the Comoro type. The most common of all the species from Aldabra. Mostly found on Picard Island. 200 metres from the sea.

Succinea mascarensis? Nevill. Larger and more strongly striated than the Mascarene specimens.

Assiminea sp. Perhaps *A. hidalgoi* Gass.= *granum* Morelet. Grande Terre. The Picard. Iles Vertes.

Cyclostoma sp. Plaine Cubi. A *Ligatella* or *Otopoma*. It seems to be a new species, but too much worn for description. Better specimens came in Sardina's collection.

Truncatella valida Pfr. Grande Terre. The Picard. Iles Vertes,

Isidora sp. Perhaps *I. forskali* Chr. = *Physa cernica* Morelet. from Mauritius. The presence of this fresh-water shell at Aldabra is very curious, the only spot provided with fresh water being a spring at Tata maca.

DR. R. E. C. STEARNS.

DR. ROBERT EDWARDS CARTER STEARNS died at Los Angeles, Cal., July 27, in his eighty-third year. He was a native of Boston, Mass., a son of Charles Stearns, and was born February 1, 1827. He was educated in the schools of his native city, followed by a course of mercantile training, and from his earliest years evinced a deep love of nature, fostered by his father, with whom similar tastes led to a degree of comradeship in rambles and hunting expeditions which he always remembered with appreciation. The boy had an unusual artistic ability, and though his early avocations were services in a bank and on a farm, when only twenty-two years of age he painted a panorama of the Hudson River from the mouth of the Mohawk to Fort William, which he exhibited with much success. He turned his attention to mining, explored the coal fields of southern Indiana, and in 1854 was appointed resident agent of several copper mines in northern Michigan on Lake Superior. In 1858 he went to California, where he became a partner in the large printing establishment of a brother-in-law of his wife, in San Francisco. This firm published the *Pacific Methodist*, a weekly religious paper, and in the troubled times preceding the Civil War the reverend editor of this journal was obliged to visit the East. Stearns was requested to fill this place during his absence. The fate of California hung in the balance; many of the immigrants from the Southern States urged

independence for that territory when hostilities broke out. Stearns took the responsibility of making his paper an enthusiastic advocate of the Union cause, and to this call and the eloquence of Thomas Starr King, old Californians believed, the decision of the people to stand by the Union in that struggle was due in no small degree. Through the influence of Justice Field, Stearns was appointed deputy clerk of the Supreme Court of California in 1862, a post which he resigned in the following year to accept the secretaryship of the State Board of Harbor Commissioners, which he was obliged to resign some years later on account of ill health. Coming to the East, he made one of a party, comprising beside himself the late Dr. William Stimpson and Col. Ezekiel Jewett, for the exploration of the invertebrate fauna of southwestern Florida, during which large collections were made for the Smithsonian Institution. He returned to California, and in 1874 was elected secretary to the University of California, being the business executive of that institution under the presidency of the late Dr. Daniel C. Gilman. He served in this capacity for eight years with great approval, and when ill health again obliged him to retire from service, the University, as expressive of their sense of his services to the cause of education in California and in recognition of his scientific attainments, conferred upon him the degree of Doctor of Philosophy. Returning to the East after the death of Mrs. Stearns, he was engaged in researches for the U. S. Fish Commission in 1882, was appointed paleontologist to the U. S. Geological Survey by Major Powell in 1884, and assistant curator of mollusks in the National Museum by Professor Baird. His collection of mollusca was acquired by the Museum. Age and infirmity obliged him to return to the more genial climate of California in 1892, where he settled in Los Angeles, continuing, as his strength permitted, his researches into the malacology of the Pacific coast. He married, March 28, 1850, Mary Anne Libby, daughter of Oliver Libby of Boston, and is survived by a daughter.

Dr. Stearns was an earnest student of mollusks from boyhood; his early experience led him to interest himself in horticulture and landscape gardening, and his ability in this line is attested by the beauty of the University grounds at Berkeley, which were developed under his superintendence. His knowledge of the Pacific coast mollusca was profound, and a long list of papers on this topic and on the shells of Florida was the result. He also contributed many papers

on various branches of horticulture and gardening to the California periodicals devoted to this subject. He was an enthusiastic supporter of the California Academy of Sciences in its early days, and after the earthquake of 1868, when disaster threatened the Society, he, with Professor J. D. Whitney and a few other friends, stood between it and dissolution. He was a member of numerous scientific societies at home and abroad, and of the Sons of the Revolution.

Dr. Stearns was a man of sanguine temperament, with a lively sense of humor and high moral character. His reading was wide, his learning never obtrusive, his interest in art, literature and all good causes intense. He was a staunch friend and, for a righteous object, ever ready to sacrifice his own material interests. His services to Californian science will keep his memory green.

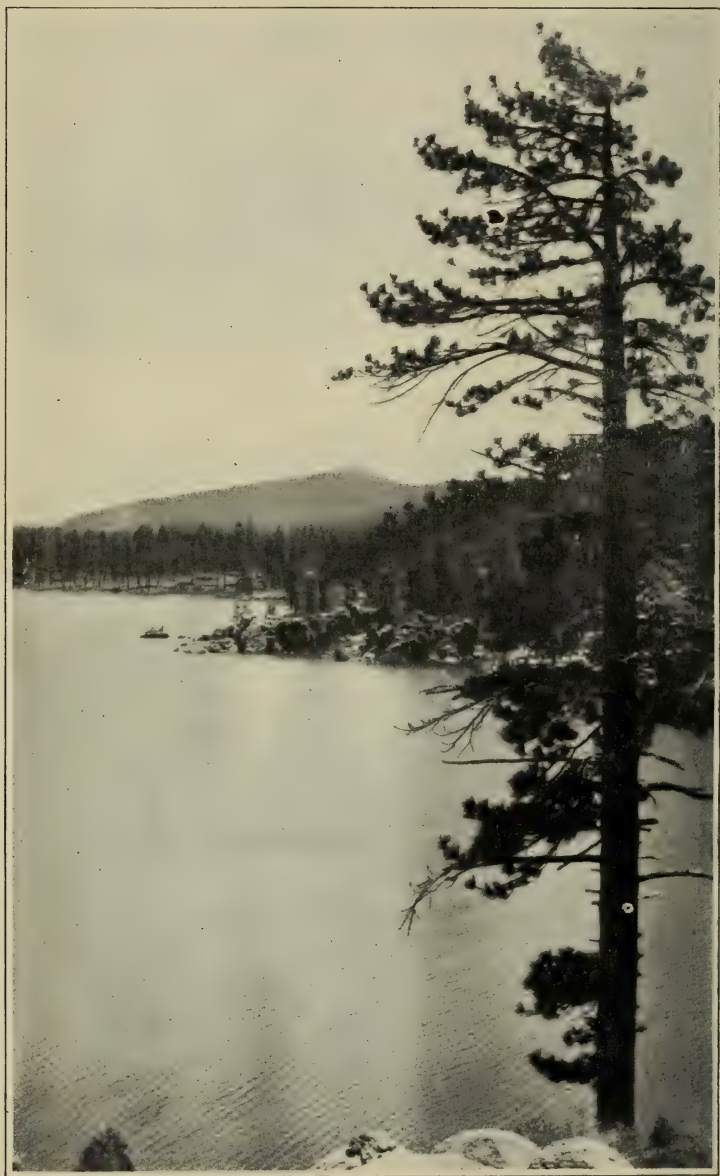
WM. H. DALL.

LUDWIG RUDOLPH SOPHUS BERGH.¹

Dr. Bergh was born in Copenhagen, October 15, 1824, and died in the same city July 20, 1909. Dr. Bergh for many years stood at the head of the small group of malacological anatomists, devoting himself especially to the Opisthobranchiata and particularly to the Nudibranchiata. His published works on these animals form a small library and a mine of detailed information. The chief results of this unremitting labor are summed up in a large quarto in which he gives a complete systematic arrangement for these animals. Besides this contribution to the knowledge of molluscan anatomy he published several valuable memoirs on other groups of mollusks, an especially notable instance being a fine memoir on the anatomy of the genus *Conus*. He was largely concerned with the publication of the great posthumous series of quartos detailing the results of the researches in eastern seas by Carl Semper, who was his intimate friend. In medicine also his publications, based on the treatment of thousands of hospital patients, took a high rank.

Personally, Dr. Bergh was most genial and agreeable in manner, ever ready to help younger students, or serve as cicerone to foreign colleagues visiting his beloved Copenhagen. Hospitable and unpretensions, a staunch friend and untiring student, his death leaves a gap in the ranks of the veterans which we may hardly hope to see filled, and a memory which those who knew him will cherish long.

¹ Abridged from the obituary notice by Dr. Wm. H. Dall (Science, XXX, p. 304, Sept. 3, 1909).



BEAR LAKE, CALIFORNIA.

THE NAUTILUS.

VOL. XXIII.

NOVEMBER, 1909.

No. 6

THE KNOWN MOLLUSCA OF SAN BERNARDINO COUNTY, CALIFORNIA.

BY S. S. BERRY.

In light of the fact that accurate data bearing on the geographical distribution of Californian land and fresh-water mollusca are still few and far between, it seems best to publish such items as may be accumulated from time to time, and in this connection the following notes (the result of several years desultory observation) may be of interest.

The district under present consideration comprises one of the largest, if not the largest, counties in the United States, being more than equal in area to any one of a number of our smaller States. By far the greater portion of its area is swallowed up by the vast Mojave and Colorado Deserts, and even at this late date is still almost an absolute terra incognita so far as the mollusca are concerned. Of necessity, therefore, the present paper treats almost exclusively of the extreme southwestern corner of the county alone, namely, the so-called San Bernardino Valley, with the adjacent San Gabriel and San Bernardino Ranges of mountains which confine it on the north and shut it off from the desert and the remainder of the county. Even for this circumscribed district, the present list makes no pretensions to completeness, but is offered merely as a résumé of our present knowledge, with the hope that it may lead to further investigation. Doubtless more than one interesting form still awaits its discovery by some diligent collector, especially in the mountain regions (see NAUTILUS XXI, p. 121, and below).

It is interesting to note that the above-mentioned valley is practi-

cally the only portion of the entire county which drains directly into the Pacific, and that, thanks to the fertile character of its soil and the water available for its irrigation from the neighboring mountains, almost the whole population of the county is concentrated here, notably in the cities of Redlands, San Bernardino, Ontario, Chino, and Colton. All are garden spots, and by the unwitting agency of man most of them have come to possess a fairly extensive molluscan fauna, many species of alien origin being now far more numerous than any of the native forms.

There have been few previous records for any of the localities of the region. Binney ['85] gives one or two species as being found in the county, but at least one of his records is without doubt erroneous. Stearns ['93] is the next author to report on specimens from our area, and his records are about all we have from the great desert region. The few records since that time are listed at the end of this paper.

My thanks are due to Dr. R. H. Tremper, of Ontario, who has generously supplied me with numerous specimens and data regarding the fauna of his immediate neighborhood. Practically all of his records are new and very interesting. I am also under obligations to Miss Nina G. Spaulding, of Redlands, whose enthusiastic efforts have aided not a little in increasing our knowledge. Data supplied through her or through Dr. Tremper are so noted by the use of their initials. I am also indebted to Mr. Sanford B. Dole, of Riverside, for the use of the accompanying photograph.

LIST OF SPECIES.

Helix aspersa Müller. Occasional around greenhouses at Redlands, but evidently not yet thoroughly at home.

Epiphragmophora traski (Newcomb). "Under dry leaves in small foothill cañon near Ontario" [R. H. T.]; also in San Antonio Cañon, two miles from mouth, elevation 2500 feet [R. H. T., April 4, 1908]; under leaves, Stoddard's Cañon, elevation 2500 feet [R. H. T., 1909].

This coast species apparently just enters the county as I have not encountered it even in the upper end of the San Bernardino Valley.

Epiphragmophora tudiculata (W. G. Binney). Mentone, under hedges; Highland, by the roadside after a rain; Arrowhead, Hot Springs; San Bernardino and vicinity; greenhouse in same city [R. H. T.]; Ontario, under stones and woodpiles [R. H. T., 1908-]

1909]; also southeast of Ontario, some seven miles from the foothills [R. H. T., March, 1909]; Frankish Cañon, under stones, altitude 2500 feet [R. H. T., April 1, 1908]; at mouth of Stoddard's Cañon, at same elevation, under stones [R. H. T., 1909].

Specimens found by Dr. Tremper in January, 1908, in an orange grove at Ontario are particularly beautiful examples of the species, some showing a curious tendency toward albinism.

Vallonia pulchella (Müller). Redlands, common in greenhouses [S. S. B., 1903, '04, '06, '08].

Vertigo occidentalis Sterki. Bluff Lake, altitude 7,550 feet, 1907 (one specimen only) [S. S. B.]; in 1908 quite common in spots in the big Bluff Lake cienaga, in the cienaga just north, and along the "New England Trail," altitude 7,500 feet; also a few specimens in a cienaga west of Green Valley, altitude 6,900 feet [S. S. B.]. Many more specimens were sent from Bluff Lake during the present summer by Miss N. G. Spaulding.

Evidently an abundant species in the more Alpine regions of the San Bernardino Mountains, and I suspect that this or a closely allied form will also turn up in similar localities in the neighboring San Gabriel and San Jacinto Ranges.

Vertigo sp. Another form occurs with *V. occidentalis* in the neighborhood of Bluff Lake [S. S. B., Aug., 1908; N. G. S., Aug., 1909].

Vertigo rowelli (Newcomb). San Bernardino [Binney, '85, p. 156]. At best a doubtful record.

Vitrina alaskana Dall. San Bernardino Mountains—a common species at Bluff Lake and vicinity [S. S. B., Aug., 1907, Aug., 1908; N. G. S., Aug., 1909]; cienaga west of Green Valley [S. S. B., July, 1908]. Especially abundant under *willow* trees at the edges of a meadow.

Vitrea cellaria (Müller). In greenhouses, Redlands [S. S. B., 1904-'08].

Euconulus fulvus (Müller). Cienaga west of Green Valley [one specimen, S. S. B., July, 1908]. Altitude 6,900 feet. Bluff Lake Meadow (altitude 7,550 feet) and the neighboring cienagas [S. S. B., Aug., 1907, Aug., 1908 (abundant); N. G. S., Aug., 1909 (abundant)]. Near mouth of Mill Creek Cañon [one specimen in drift, S. S. B., July, 1908]. Forest Home, altitude 5,200 feet, a colony of about 20 live individuals found by the writer under sticks on the bank of Mill Creek, June 12, 1909.

“San Gorgonio Pass” [Binney, '85, p. 68]. The exact locality of Binney's specimens is doubtful, but not of great importance as this is evidently a common mountain species, occurring throughout the San Bernardino Range. I have as yet seen no specimens from the San Gabriels.

Zonitoides orea (Say). Mouth of Stoddard's Cañon, near Ontario, under leaves [R. H. T., 1909]. Redlands, in greenhouses [S. S. B., 1904–1908]. Bluff Lake [S. S. B., 1907]; Bluff Lake and cienaga just north [S. S. B., Aug., 1908—ten specimens]; several specimens, same locality [N. G. S., Aug., 1909].

Zonitoides milium (Morse). Greenhouse, Redlands, one specimen [S. S. B., 1904].

Zonitoides minuscula (Binney). Greenhouse, Redlands [S. S. B., 1904].

Limax maximus Linnaeus. Redlands, in greenhouses in 1904 [S. S. B.]; now abundant about houses and in yards everywhere. Reported from same locality by Bartsch ['04, p. 12].

Ontario [R. H. T., 1908, 1909]. The last specimens sent me by Dr. Tremper were the most light-colored of the species I have seen in California.

Limax flavus Linnaeus. Redlands, with *L. maximus* [S. S. B., 1904].

Pyramidula cronkhitei (Newcomb). Cienaga, north of Bluff Lake Meadow, San Bernardino Mountains, altitude 7,500 feet [S. S. B., 16 specimens, Aug., 1908; N. G. S., Aug., 1909, abundant].

Punctum californicum Pilsbry. Occasional in Bluff Lake Meadow under sticks [S. S. B., Aug., 1908]; Cienaga, north of Bluff Lake, altitude 7,500 feet, not rare [S. S. B., Aug., 1908; N. G. S., Aug., 1909]. Being in doubt as to whether these specimens were correctly referred to this species, examples were sent to Mr. Bryant Walker, who confirmed the identification.

Punctum conspectum (Bland). Near Green Valley, San Bernardino Mountains, altitude 6,900 feet, 3 specimens [S. S. B., July, 1908]; Bluff Lake, one specimen [S. S. B., Aug., 1908].

Succinea oregonensis Lea. Lower end of the big Cienaga at Bluff Lake along the “New England Trail,” 18 specimens [S. S. B., Aug., 1908] 13 specimens [N. G. S., Aug., 1909].

Lymnæa palustris (Müller). Bear Lake, altitude 6,700 feet, San Bernardino Mountains, abundant [S. S. B., 1907, 1908].

Lymnæa palustris nuttalliana (Lea). Creek and swamp at Bluff Lake, altitude 7,550 feet, abundant [R. D. Williams, 1905; S. S. B., 1907, 1908; N. G. S., 1909]. These specimens very uniform in appearance. Bear Lake, intergrading with typical (?) *palustris*, common [R. H. T., Aug., 1902; S. S. B., Aug., 1907, 1908].

Lymnæa humilis modicella (Say). On flower pots in greenhouses, Redlands, abundant [S. S. B., 1904-'08].

Lymnæa caperata Say. A single very juvenile specimen collected by Dr. Tremper in a pool in San Antonio Creek, 2 miles from mouth [April 4, 1908], was identified as this species by Mr. F. C. Baker.

Lymnæa bulimoides Lea. Mojave River, near Daggett [Stearns, '93].

Physa gyrina (Say) ? Redlands, in irrigating ditches; Garlick Springs [Stearns, '93]; Daggett [Stearns, '93].

I suspect that most if not all the Southern California records of *P. gyrina* need re-examination, and the above will more than likely prove to be varieties of *P. virginea* Gould.

Physa lordi Baird. Artificial pond, Ontario, the water of which comes from Hermosa Cañon [R. H. T.]. Specimens of this fine large species were sent to Mr. F. C. Baker, who agrees with me in referring them to *P. lordi*.

Physa virginea Gould. Ditches and reservoirs in Redlands, common [S. S. B., 1907, 1908].

Physa virginea traski Lea. Main irrigating ditch of Ontario, near mouth of San Antonio Cañon, altitude 2,200 feet [R. H. T.].

Physa cooperi Tryon. Watering trough in City Creek Cañon, San Bernardino Mountains [S. S. B., Aug., 1907, July, 1908]; Bear Lake, altitude 6,700 feet [S. S. B., Aug., 1907-'08].

Physa politissima Tryon. Bear Lake, altitude 6,700 feet, not uncommon [S. S. B., 1907, 1908].

Dr. Pilsbry, to whom I sent specimens of this and the preceding species, and to whom I owe their determinations, wrote as follows: "It should be said that the synonymy of West Coast *Physas* has never been worked up, and the ultimate names which will be used cannot now be decided, but your specimens correspond closely to the *type lots* of the forms mentioned, whether these be species or varieties."

Planorbis trivolvris Say. England's Park, Redlands; swamp and creek at Bluff Lake [S. S. B., 1907, 1908; R. D. Williams,

1905]; Bear Lake [R. H. T., 1902; S. S. B., 1907, 1908]; Daggett [Stearns, '93].

Planorbis parvus Say. Mojave River, near Daggett [Stearns, '93]; Swamp at Bluff Lake [S. S. B., 1907, 1908]; Bear Lake [S. S. B., 1907, 1908].

The specimens from Bear Lake were identified by Dr. Dall as *P. vermicularis* Gould. They certainly have a slightly different aspect from the Bluff Lake specimens, but I doubt if they are distinct.

Paludestrina stearnsiana Pilsbry. Rill near mouth of Mill Creek Cañon, San Bernardino Mountains, very abundant in July, 1908 [S. S. B.], but a rather hasty search in the same locality one year later did not yield a specimen.

Mountain Home Creek, San Bernardino Mountains, altitude 3,600 feet [S. S. B., July 11, 1909].

[*Paludestrina protea* Gould. In numerous collections I have seen large series of this species in a subfossil condition which were distributed some years ago by an unknown collector as from the "Mojave Desert." They are probably from San Bernardino County, so I record them here, although "Colorado Desert" may have been what the label meant. As the species is known to exist in Inyo and Riverside Counties, it may reasonably be expected to turn up in the living condition in this county as well.]

[*Valvata lewisii* Currier. San Bernardino Mountains, Cal. [fide Dall, '05, p. 123; also see Walker, '06, p. 26].

I have not seen any of Dall's specimens, but I have no doubt whatever that they really represent not *V. lewisii*, but the following form:]

Valvata humeralis californica Pilsbry. Swamp at Bluff Lake, altitude 7,550 feet [S. S. B., Aug., 1907, 1908; N. G. S., Aug., 1909—not very abundant].

Bear Lake, altitude 6,700 feet, the type locality [S. S. B., Aug., 1907, 1908].

For this form beside the references given above under *V. lewisii*, see Berry, '08, p. 122, and Pilsbry, '08, p. 82.

Anodonta californiensis (Lea) var. Chino Creek. S. of Ontario [R. H. T., 1908].

Musculium raymondi (J. G. Cooper). Swamp and creek at Bluff Lake, large and abundant in 1905 [R. D. Williams]; very common but small in 1907 [S. S. B.]; more rare in 1908 [S. S. B.] and 1909 [N. G. S.]; apparently being replaced by the following species.

Pisidium californicum (Newcomb?). Swamp and creek at Bluff Lake, common in 1907 [S. S. B.], abundant in 1908 [S. S. B.], and 1909 [N. G. S.].

Pisidium ashmuni Sterki. Swamp at Bluff Lake [S. S. B., 1907]. Identified by Dr. Sterki.

Specimens of *Pisidia* have also been found in Kid Creek, San Bernardino Mountains [N. G. S., Aug., 1909], and in Mill Creek at Forest Home, altitude 5,200 feet [S. S. B., July, 1908], but have not as yet been determined by Dr. Sterki.

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RANGE OF *LYMNÆA UMBILICATA*.

BY FRANK C. BAKER.

This recently recognized and very distinct species has been reported from a number of rather widely separated localities. Its range would seem to be from Ontario and Northern Maine west to southeastern Michigan and south to New Jersey. It has doubtless been identified as *humilis* and will be found in many collections under this all embracing name. *L. umbilicata* is not a race of *L. cubensis*, as suggested by Mr. Walker, but a distinct species, the radula having tricuspid laterals where those of *cubensis* are bicuspid.¹

The known records are as follows :

UNITED STATES.

Connecticut: Small stream emptying into Farmington River, Unionville, Hartford Co. (Baker).

Maine: Buckfield, Oxford Co. (J. A. Allen); Woodland, Aroostook Co. (Nylander); Fox Island, Penobscot River, Knox Co. (Jackson).

Massachusetts: New Bedford, Bristol Co. (Adams); Brook near Cabor's Park, Newton; Charles River above Watertown, Middlesex Co. (Baker); Swampscott, near Lynn, Essex Co. (Tufts); Southborough, Worcester Co. (Bos. Soc., N. H.); Salem, Essex Co. (True); Essex Co. (Russell); Westfield, Hampden Co. (Smith. Coll.).

Michigan: Otter Lake, Lapeer Co. (Walker).

New Jersey: Drainage ditches east of Burlington, Burlington Co. (Baker; Pilsbry).

New York: Maplewood Park, Rochester, Monroe Co.; South end Cayuga Lake, near Ithaca, Tompkins Co. (Baker); Charlotte Lake, Columbia Co. (Lea).

Rhode Island: The Fountain, Pawtucket, Providence Co. (H. F. Carpenter); Rhode Island (Walker).

BRITISH AMERICA.

Ontario: Ottawa, Carleton Dist. (Heron); Carleton Co. (Walker).

¹ See Mr. Walker's excellent article in *Ottawa Nat.*, XXII, page 89, for the distinguishing characteristics of *L. umbilicata*.

THE MOLLUSCA OF DOUGLAS COUNTY, KANSAS. GASTEROPODA.

BY G. DALLAS HANNA.

As one travels westward from the Mississippi River, the gradual diminution of the forest growths is very apparent. Tracts of timber get smaller and smaller and the trees become more stunted in growth until when the middle of Kansas is reached there are only a few cottonwoods, confined to a narrow belt along the banks of streams. Eastern Kansas is then a transition zone, where the timbered regions of the east fade gradually into the vast semi-arid plains of the southwest.

A botanical condition such as this is bound to have a very great influence upon a group of animals as closely associated with vegetable growths as the land mollusks are. We find some species—as the majority of the *Polygyras* for instance—extending only as far west as the trees go. Moisture and shade are requisites to their existence, and we find them becoming rarer in direct proportion to the decrease in vegetation. They have migrated westward just as fast but no faster than the trees.

And on the other hand there are some species of the plains area which do not extend appreciably into the timbered regions. On the border-line then, as we would expect, we find an intermingling of the two faunas.

Douglas County is a typical border county. Trees exist in little patches here and there but are mostly confined to the near vicinity of streams. Mollusks are not plentiful and generally distributed, but are addicted to living in colonies in the patches of trees.

Among the most important tracts of timber conchologically is Blue Mound, situated six miles southeast of Lawrence. This little hill which rises two hundred and fifty feet above the river flood plain, supports an excellent growth of small trees. Under the dead leaves and loose stones the small snails are to be found more abundant than any place else in the county.

The outcropping limestone ledges furnish several species which belong in general to the southwestern plains fauna. *Bulimulus dealbatus*, *Vallonia parvula*, *Bifidaria procera* and *Zonitoides singlyana*, are abundant in some such localities where there are no trees for miles.

Localities favorable for fresh-water snails are rare. The only

bodies of standing water in the county are small, and with one or two exceptions are artificial ponds. Horseshoe Lake and Lake View are natural basins but both are small and contain but few mollusks. The small streams emptying into the Kansas River contain a few shells very locally distributed. The River is too sandy for these animals.

The family *Ancylidæ* seems not to have a representative in these waters.

Very little collecting previous to 1908 has ever been done in Douglas County. *Polygyra m. chadwicki*, a dentate variety of *Polygyra multilineata* was described by Ferriss in the NAUTILUS for August, 1907, from specimens collected along the Kansas River at Lawrence. Aside from this one reference I have never found the shells of this county alluded to. Therefore I append the following list, based upon two years' collecting in which the entire county has been thoroughly searched. Probably not many more species will be collected. Four or five are withheld from this list because of uncertain identification.

Dr. V. Sterki has examined the *Pupidæ*, and Mr. F. C. Baker, the Lymneæ, to both of whom I am very grateful.

Polygyra profunda Say.

Polygyra albolabris alleni Wetherby.

Polygyra multilineata Say.

Polygyra multilineata chadwicki Ferriss.

Polygyra divesta Gould. A single specimen found in drift along the Kansas River at Lawrence.

Polygyra clausa Say. With the exception of *P. profunda* and *P. albolabris alleni*, which range into Shawnee County on the west, Douglas County marks the extreme western range of the Mesodons. All the species are rare in this locality, and are found on the northern shaded slopes of hillsides which have limestone outcropping.

Polygyra dorfeuilliana Lea. Dead shells were found under conditions such that the species must be living here.

Polygyra monodon Rackett. This form lives on Blue Mound.

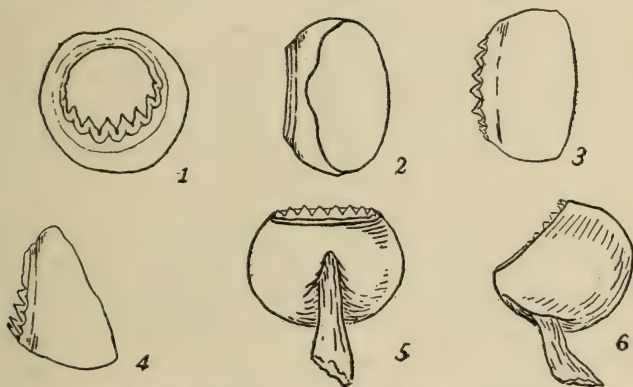
Polygyra fraterna Say. The common *Polygyra* of Kansas. Found everywhere.

Polygyra fraterna aliciae Pilsbry. Occasionally found with *P. fraterna*.

(To be continued.)

NOTES.

SUCKERS FROM THE BIG SQUID.—On visiting Provincetown in August I made inquiries regarding the Giant Squid taken the last of March, 1909, off Highland, Truro, Mass., and mentioned in *THE NAUTILUS* for July, 1909. I was unfortunate in not securing the beaks which had been thrown away, but I saw the $7\frac{1}{2}$ foot tentacle, which was preserved in dry salt. I obtained the cartilage of one of the suckers, and, with permission from the owner, cut off one of the suckers about mid way on the tentacle. As this is the only specimen taken in Massachusetts I have thought it might be of sufficient interest to the readers of *THE NAUTILUS* for me to give sketches to show the shape of this cartilage and the curious arrangement of the serration of the margin.



Figs. 1, 2, 3, 4 are different views of the cartilage of one specimen, while Figs. 5 and 6 are the views of a sucker cut from the middle of the tentacle. All figures are magnified twice.

The tentacle is now in the possession of a gentleman in Provincetown, Mass.—J. HENRY BLAKE.

HOMALOGYRA ATOMUS IN RHODE ISLAND.—In a recent number of the *NAUTILUS* I mentioned the discovery of *Homalogyra atomus* on the New England coast at Hampton, N. H. It was first discovered by Philippi in Sicily; since then it has been found in other parts of the Mediterranean, Norway, England and France, but this is the first time it has been recorded on this side of the Atlantic. Miss M. W. Brooks has lately found this species in shell sand, from

Newport, R. I. Its occurrence north and south of Cape Cod indicates a somewhat wide distribution of the species.—EDWARD S. MORSE.

JOSEPH F. WHITEAVES.¹—Dr. Joseph Frederick Whiteaves, the distinguished Palæontologist of the Canadian Geological Survey, died on the 8th of August, 1909, after an illness of several months.

Dr. Whiteaves was born in Oxford, England, in 1835, and first came to this country in 1861 on a short visit, returning the following year to make his residence in Montreal, Canada, where for twelve years he was officially connected with the Montreal Natural History Society. In 1876 he was appointed Palæontologist of the Geological Survey to succeed the late Mr. E. Billings.

His works on the palæozoic and mesozoic fossils of Canada are monumental, and the broad scope of his work both in palæontology and zöology can only be appreciated by a perusal of his numerous papers which number nearly 150, in which over 450 new genera, species and varieties are described.

Dr. Whiteaves was of a generous and kindly disposition, always ready to aid and impart information. He was an ideal type of a man imbued with the professional spirit, striving for the best results, not satisfied with half measure, and ever urged on by the love of his work.

MISS J. E. LINTER.—We regret to announce the death of Miss J. E. Linter which occurred on August 30, 1909, at Twickenham, England. Her valuable collection of shells will be offered (as a legacy, on condition that it is accessible to the public) to the Exeter Museum.

WE learn with regret of the death, September 26th, of Professor Anton Dohrn, the founder and director of the Zoölogical Station at Naples.

MESSRS. FERRISS AND DANIELS are exploring the Kaibab and Kanab plateaus for shells and ferns. In this little-known country north of the Grand Canyon of the Colorado, they report beautiful scenery, a superb climate, and plenty of shells.

ERRATA.—In the last number the following errors should be noted: P. 67, line 13 from bottom, last word, should be "*more*" in place of "*less*;" line 4 from bottom should be "*No. 10. l*" in place of "*10.*"

¹ Taken in part, from The Ottawa Naturalist, September, 1909.

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No. 7

ON SOME DEFORMED CYPRÆA TIGRIS FROM THE COLLECTION OF A. DA COSTA GOMEZ.

BY H. A. PILSBRY.

Many years ago the conchologists of Europe were astonished to receive from New Caledonia certain cowries which had the aspect of such well-known species as *C. moneta*, *lynx* and *mappa*, yet differed by the produced and calloused ends, attended with more or less thickening of the enamel and a degree of melanism, or clouding of the color-pattern. Several of these shells were named as distinct species by Crosse, Marie, Montrouzier and others. British writers generally did not admit their validity, considering them pathologic forms, due to some diseased condition of the mantle, a view ridiculed by Crosse in his witty review of G. B. Sowerby's monograph of *Cypræa* in the *Thesaurus Conchyliorum*. Mr. S. Raymond Roberts in his monograph¹ treats them as varieties. M. Ph. Dautzenberg has recently discussed these forms, figuring several of them.² The cause of the rostration and hypertrophic deposit of calcareous material has never been really settled, so far as I know, by observations on the living animals. The occurrence of so many forms modified in the same manner, in one locality, points to the action of one specific cause which might perhaps be recognized by an observer on the spot. It seems, however, that the modifications do not have racial significance. A somewhat similar formation characterizes some undoubtedly "good" species elsewhere, such as *C. scottii* and *C. problematica*.

¹ Manual of Conchology, Vol. VII.

² Journal de Conchyliologie, 1906, p. 263. plate ix.

Mr. A. DaCosta Gomez has called our attention to several New Caledonian examples of *Cypræa tigris* L. in his collection which show a rostration like the New Caledonian forms mentioned above, together with others diversely modified; and as such forms have not, to our knowledge, been noticed in this species, we have figured four of them on plates vii and viii, the two plates representing different views of the same specimens.

I. The upper left hand figures show a shell having a broad chestnut dorsal streak, the rest of the back being clouded with chestnut, light blue and dull pale brown. On the margins may be seen the characteristic dappled coloring of *tigris*. The base is normally colored. At the anterior end there are large callous lumps. The posterior end is also a little produced. Length 83 mm.

II. Upper right figures. This shell is broad and very heavy (weighing $7\frac{1}{8}$ ounces). The dorsal streak is interrupted, chestnut, partially overlaid with bluish callus. Elsewhere it is a soiled cream-white, obscurely and irregularly mottled. The base is stained with yellow around the mouth. The sides are very heavily calloused and lumpy. Length 90 mm.

III. Lower left figures. This shell is heavily calloused and produced at the ends and on the right margin. The spotted *tigris* pattern appears on the other side, but is covered by a dark enamel in the middle of the back. Base white, with some yellowish suffusion in places. Length 98 mm. This shell is characteristically New Caledonian in appearance.

IV. Lower right figures. A broad form, heavily calloused at the sides. The dorsal streak is dark purplish-brown; remainder of the back bluish-white, irregularly mottled and spotted with orange-brown and purple-brown, ends blackish. The base and teeth are brownish-yellow except for a pure white area on the inner lip. Length 85 mm.

ESSEX COUNTY NOTES.

BY REV. HENRY W. WINKLEY.

My last article was an urgent invitation to fellow-laborers to inspect mud. We may now view some results of the inspection.

Just south of Cape Ann, Mass., is a bay with many branches, forming harbors for Marblehead, Salem, Beverly and Danvers. The

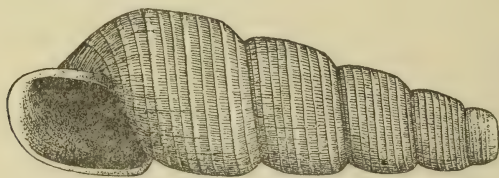
inner waters, *i. e.*, at Danvers, seemed to be favorable for a colony of the forms which are common south of Cape Cod, but local and in sheltered places north of that cape. Only a partial examination has been made, but results are interesting. One mud flat of small area, and uncovered at low tide, was swarming with life. Literally I obtained quarts of *Gemma gemma*. With these were other species more or less abundant. *Columbella*, *Ilyanassa*, *Polinices* and such forms are expected and were found as usual. *Odostomia* revealed *trifida*, *bisuturalis*, *winkleyi* and a new species described below. I was able to secure here a living specimen of the disputed *fusca*, and observe the animal. Unlike some of this group, that are said to be timid in captivity, *fusca* was very active. Bulletin 37 of the U. S. Natl. Mus., plate xxvi, figs. 1 and 2, are labeled animal of *Turbonilla interrupta*. Slight changes would make the drawing for *fusca*. The plate gives the front of the foot in four lobes; for *fusca* it should be a continuous curve. From the plate one would infer that the mentum was of two flaps, one overlapping the other. In *fusca* this would not be correct, but a deep groove runs along the median line. The front of the mentum is a double curve, and its end is held close to the surface ahead of the foot in crawling, as if it was feeling the way. Eye spots are easily seen at the bases of the tentacles. The animal is semi-transparent, with parts a deep maroon. The tentacles are slender and held close to the mentum.

The above-named species were found at the headwaters, but no evidence of *Turbonilla*, as I had hoped. Rowing down river I smelt them, and came back for my dredge. A dozen specimens of *T. winkleyi* were found, good size, but badly eroded. In other parts of the Danvers River *Venus mercenaria*, *Astarte nucula* and some other forms occur, but I postpone exact lists until more work can be done. One unusual find was a solitary specimen of *Bela bicarinata* var. *violacea* on a mud flat between tides.

Later work was done at Salem. The inner harbor revealed the last-named species, with beautiful violet coloring, especially when wet. Salem harbor is practically all mud bottom. *Polinices*, *Nucula*, *Yoldia*, *Crenella*, *Periploma*, *Lyonsia*, *Tellina*, *Nassa*, *Bela*, *Retusa*, etc., are obtained at moderate depths. Shore collecting revealed the usual species, with some things worth noting. *Acmæa testudinalis* is very small and *alveus* scarce. At one small cove at low tide, with eel grass, I found another colony of *Turbonilla winkleyi*.

Passing to the outer harbor there is a slight change. More species of *Bela*, for example. Here I met a surprise in finding a third colony of *Turbonilla*. As the outer harbor is practically open sea, the occurrence is unusual. In fact the only locality known to me north of Cape Cod where that form occurs save in inner waters. So much ground remains to be examined that this report must be imperfect, yet the area covered showed *Astarte* very scarce. *Thyasira* lacking, and some other forms expected did not appear. I am told that there are small beds of them in places not yet dredged.

A few years ago the writer was stationed near New Haven. At that time I received much help from Dr. Bush, and together we examined many specimens of *Turbonilla*, *Odostomia*, *Bela* and other genera. It is my desire to recognize my high appreciation for her kind help by naming the following species for her. I am confronted with the fact that one *Odostomia* already bears her name. Not to be defeated in my purpose, I will use her first name, and am sure she will pardon me this time.



Odostomia (Evalina) katherinae, new species.

Shell much smaller than *O. (E.) winkleyi*, bluish-white, semi-translucent. Nuclear whorls deeply obliquely immersed in the first of the succeeding turns, above which the tilted edge of the last volution only projects. Post-nuclear whorls well rounded, with a very strong beveled shoulder, marked by many very slender axial threads and a number of fine spiral lirations, of which one is at the angle of the shoulder, one on the shoulder a little nearer the suture than the angle; one forms the weak peripheral angle, and six others divide the space between the peripheral angle and the angle at the shoulder into subequal spaces. Sutures strongly constricted. Base short, well rounded, marked by spiral threads, of which the second one below the periphery is as strong as the peripheral one, the other four being of equal strength; the two basal ones dividing the space be-

tween the umbilical area and the stronger thread into three equal parts. Aperture very broadly oval, posterior angle very obtuse; outer lip thin, showing the external sculpture within; columella very slender, slightly twisted and very slightly revolute, provided with a very weak fold, which is scarcely discernible in the aperture, but becomes apparent when the pillar is exposed by grinding; parietal wall glazed with a light callus.

Specimens were found in the Danvers River, on a mud flat between tides, most of which are in the Winkley collection, and seven in the U. S. National Museum, cat. No. 208067. The one figured has $5\frac{1}{2}$ whorls and measures, length 2.15 mm., diameter 0.8 mm.

NEW *HELICINA* AND *STROBILOPS* FROM FLORIDA.

BY H. A. PILSBRY.

Several years ago Mr. G. H. Clapp called my attention to a form of *Helicina* differing in several respects from *H. orbiculata* Say, the specimens having been received from Mr. C. T. Simpson, who collected them at Lemon City, Florida. At about the same time Mr. Vanatta encountered the form in material from Lee Co., Fla., collected by Mr. C. B. Moore. He subsequently published a list of these shells (NAUTILUS for January, 1908, pp. 99-104), mentioning the form in question as *Helicina orbiculata* var. *clappi* Pils. MSS. No description has been published.

Helicina orbiculata was described from the mouth of the St. John's River. The types, four specimens, are still preserved with Say's label. They are globose, very pale greenish-white, and measure from alt. 6, diam. 6.8 mm., to alt. 6.3, diam. 7.7 mm. There is a distinct tooth at the junction of the columellar and basal lips. The periphery is well rounded.

In the St. John's River valley, away from the coast, and where calcareous material is almost wanting in the soil, there is a small race of *orbiculata*, measuring, alt. 5.5, diam. 6.8 mm., to alt. 4.5, diam. 5.1 mm.

H. orbiculata extends from Florida and Georgia west to Tennessee and western Louisiana. West and southwest of this it is entirely replaced by *H. orbiculata tropica* 'Jan.' Pfr., distinguished by its heavier shell and very thick lip.

HELICINA ORBICULATA CLAPPI, n. subsp.

The shell is less globose than *orbiculata*, tending to a more trochiform shape, the last whorl being very obtusely subangular at the periphery. The outer lip is more broadly expanded, thin, and there is only a weak angle or none at the junction of columella and basal lip. The color is white, very pale citrine, white with two red bands, or uniform red, the lip and apex pale.

Alt. 8, diam. 9 mm.

Alt. 7, diam. 8 mm.

Alt. 6.1, diam. 7.3 mm.

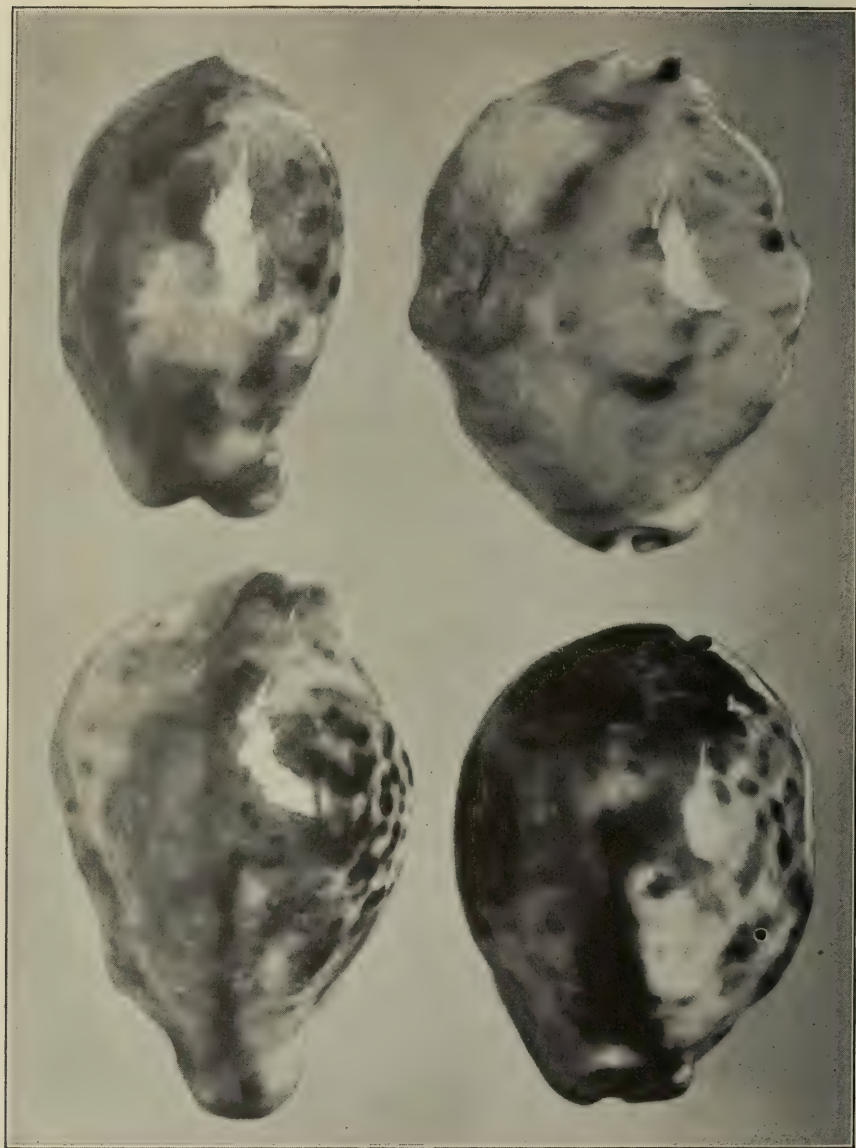
Distribution: Southern Florida, Dade, Lee and Monroe counties; types from Miami, Dade Co., collected by S. N. Rhoads and H. A. Pilsbry, 1899. On the east coast *H. o. clappi* extends as far north as Palm Beach (Pilsbry, 1899); on the west coast to Evans' Plantation on the Manatee River (C. T. Simpson).

Key to Subspecies of H. orbiculata.

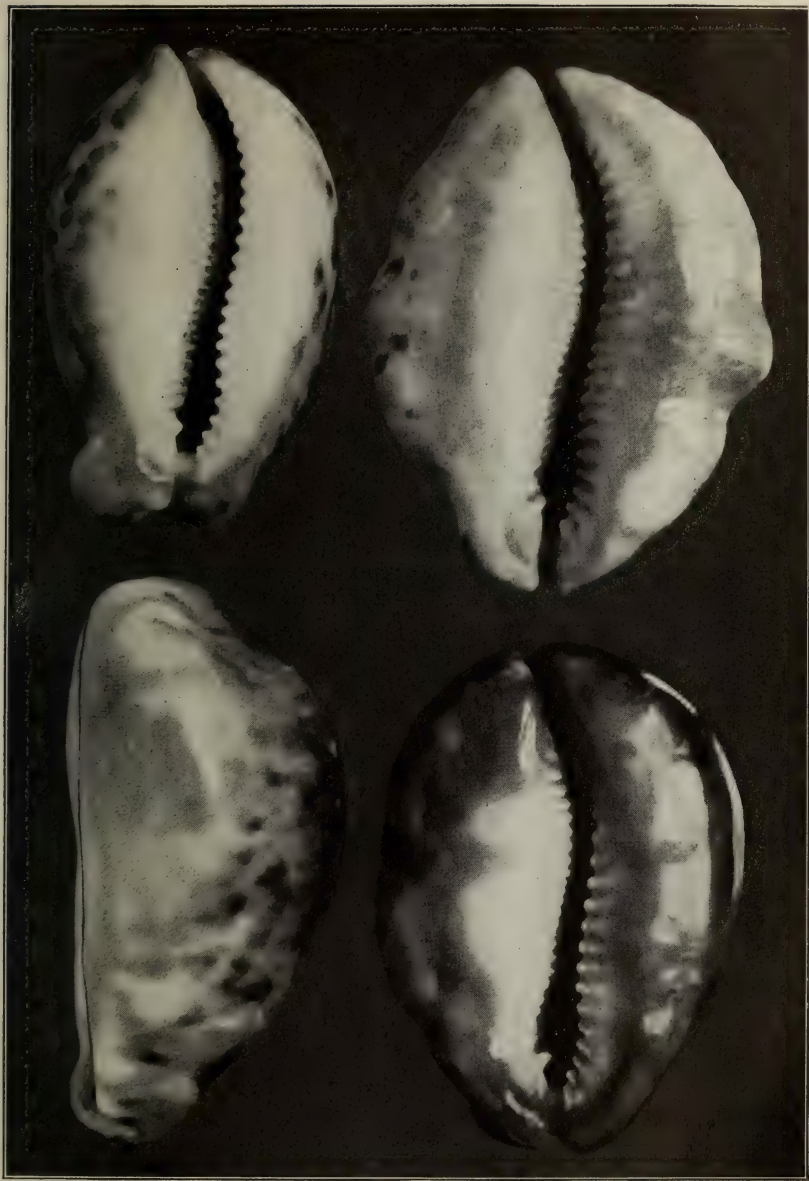
- a.* Last whorl globose, periphery well rounded; a distinct tooth or angle at base of the columella.
 - b.* Lip thin or not much thickened, *H. orbiculata*.
 - bb.* Lip much thickened, *H. o. tropica*.
- aa.* Last whorl very obtusely subangular, the shape approaching trochiform; no distinct tooth at base of the columella, *H. o. clappi*.

STROBILOPS FLORIDANUS, n. sp.

The shell is conic with convex outlines, almost dome-shaped; the periphery only weakly angular, the base convex; rather solid; brown, the summit whitish-corneous. Whorls $5\frac{1}{2}$, the first two smooth, the rest sculptured with narrow, rather widely separated ribs (about 30 on the last whorl). These ribs continue on the base, which is radially ribbed. Aperture semilunar, the peristome thick, narrowly reflexed, brown or whitish; parietal callus rather thick at the edge. Parietal lamella emerging to the edge of the callus, fully a whorl long. Infraparietal lamella scarcely emerging, penetrating as far inward as the parietal lamella. The inner half of this lamella and the parietal is nodose, the nodes minutely asperate. Interparietal lamella very low, about a half whorl long, nodose, penetrating as deeply as the parietal lamella. There is one axial lamella and four basal plicæ,



CYPRÆA TIGRIS FROM A. DA C. GOMEZ COLL.



CYPRÆA TIGRIS FROM A. DA C. GOMEZ COLL.

the outer one peripheral in position; a single palatal plica is generally developed. These plicæ form a curved, very obliquely radial series, the inner end near the aperture. The two inner basal lamellæ are much stouter and higher than the others, the second from the axis (or third, counting the axial) being the longest and highest of the plicæ.

Alt. 1.8, diam. 2.5 mm.

Florida: Type No. 77044 A. N. S. P., from Miami, collected by S. N. Rhoads, 1899. Also widely distributed over the State. Tallahassee (C. W. Johnson, 1900), St. John's valley, Volusia and Marion counties (Johnson and Pilsbry, 1894) and many other localities.

This species resembles *S. virgo* Pils. in shape and peristome, but it differs in the more widely spaced ribs, continued over the base. It differs from all known North American species by the *much more deeply entering parietal lamellæ*, the inner ends of which pass under the parietal callus of the aperture. In other species these lamellæ are only about a half whorl long. The inner basal plicæ are also placed more deeply within than in other species. *S. texasiana* Pils. and Ferr. resembles *S. floridana* in shape and in having a ribbed base, but the sculpture is much closer and the lamellæ do not extend so far inward.

S. floridanus is a common and widely distributed species in Florida. A depressed and angular form of *S. labyrinthicus* resembling *S. l. strebeli* occurs in some places, and *S. hubbardi* (A. D. Brown) also has a wide distribution on the peninsula and keys.

Several other races of *Strobilops* will be defined in a future paper. The shells have to be opened carefully to demonstrate the internal structure, but fresh specimens can usually be determined without opening. Information is especially desired by the writer on the forms of New York State, and will be duly credited in a monograph of that fauna now in preparation.

MOLLUSKS FROM KANSAS AND OKLAHOMA.

BY FRANK C. BAKER.

During the past year Mr. F. B. Isely, Professor of Biology in the Oklahoma University Preparatory School, Tonkawa, Oklahoma, has sent to the Chicago Academy of Sciences several interesting lots of

shells from Kansas and Oklahoma. As this region is not well known conchologically, it has been thought that a list of the species would be of value as a contribution to the subject of geographic distribution. The region includes Grant and Kay counties, Oklahoma, and Sumner, Harper and Kingman counties, Kansas. The collection is now deposited in the Chicago Academy of Sciences. My thanks are due to Mr. Bryant Walker and Dr. V. Sterki for assistance in determining critical material.

PELECYPODA.

Lampsilis anodontoides (Lea). Chikaskia River, Tonkawa, Oklahoma.

Lampsilis subrostrata (Say). Spring Creek, Grant county, Oklahoma.

Lampsilis parva (Barnes). Bluff Creek, Grant Co., Oklahoma.

Lampsilis purpurata (Lamarck). Chikaskia River, Tonkawa, Oklahoma.

Lampsilis gracile (Barnes). Shoofly Creek, Williston, Oklahoma.

Plagiola donaciformis (Lea). Chikaskia River, Hunnewell, Kansas.

Tritogonia tuberculata (Barnes). Chikaskia River, Tonkawa, Oklahoma.

Anodonta grandis Say. Chikaskia River, Tonkawa, Oklahoma; Chikaskia River, Williston, Oklahoma.

Anodonta corpulenta Cooper. Duck Creek, near Tonkawa, Oklahoma.

Anodonta imbecilis Say. Shoofly Creek, Williston, Oklahoma.

Symphynota complanata (Barnes). Chikaskia River, Tonkawa, Oklahoma; Chikaskia River, Williston, Oklahoma.

Unio tetralasmus camptodon Say. Spring Creek, Anthony, Kansas.

Unio tetralasmus sayi Ward. Spring Creek, Grant Co., Oklahoma.

Quadrula undulata (Barnes). Chikaskia River, Tonkawa, Oklahoma; Chikaskia River, Drury, Kansas; Shoofly Creek, Williston, Oklahoma.

Quadrula undulata latecostata (Lea). Shoofly Creek, Williston, Oklahoma.

Quadrula lachrymosa (Lea). Chikaskia River, Tonkawa, Oklahoma; Chikaskia River, Drury, Kansas.

Quadrula pustulosa (Lea). Chikaskia River, Tonkawa, Oklahoma; Chikaskia River, Drury, Kansas.

Quadrula pustulosa var. Chikaskia River, Drury, Kansas.

A peculiar shell is associated with *pustulosa* at this locality. It is compressed, quite elongated, and the surface is ornamented with many olive-green rays, radiating from the umbones. It is smooth, like *schoolcraftensis*, but is much more elongated than that variety, to which the Oklahoma *pustulosa* might quite appropriately be referred. No specimens of the typical *pustulosa* have been seen from the region in question. Additional material may show this to be a recognizable race of *pustulosa*.

Quadrula rubiginosa (Lea). Chikaskia River, Drury, Kansas.

Quadrula coccinea (Conrad). Chikaskia River, Drury, Kansas; Chikaskia River, Tonkawa, Oklahoma.

Sphærium simile Say, variety. Tonkawa, Oklahoma; Wild Horse Creek, Spivey, Kansas.

A much elongated and very cylindrical shell, which may prove to be a race of *simile*.

Sphærium striatinum Lamarek. Sand Creek, Argonia, Kansas.

Musculium transversum (Say). Shoofly Creek, Williston, Oklahoma.

Musculium elevatum (Haldeman). Tonkawa, Oklahoma; Meridian Creek, South Haven, Kansas.

Not quite typical, the shell being more elongate ovate in outline than in typical *elevatum*.

GASTROPODA.

Physa crandalli Baker. Wild Horse Creek, Spivey, Kansas; Sand Creek, Argonia, Kansas; Meridian Creek, South Haven, Kansas; Spring Creek, Anthony, Kansas; Shoofly Creek, Williston, Oklahoma; Spring Creek, Grant Co., Oklahoma.

Physa ancillaria Say. Spring Creek, Grant Co., Oklahoma; Wild Horse Creek, Spivey, Kansas; Tonkawa, Oklahoma; Shoofly Creek, Williston, Oklahoma.

The specimens are exactly comparable with typical *ancillaria* from Philadelphia.

Physa anatina Lea. Tonkawa, Oklahoma.

Ancylus rivularis Say. Shoofly Creek, Williston, Oklahoma.

Planorbis trivolvis Say. Wild Horse Creek, Spivey, Kansas; Spring Creek, Grant Co., Oklahoma.

Planorbis deflectus Say. Spring Creek, Anthony, Kansas.

Lymnæa obrussa Say. Wild Horse Creek, Spivey, Kansas; Sand Creek, Argonia, Kansas.

Lymnæa parva Lea. Tonkawa, Oklahoma.

Lymnæa techella Hald. Tonkawa, Oklahoma.

Succinea avara Say. Spring Creek, Anthony, Kansas.

Succinea luteola Gould. Tonkawa, Oklahoma.

Agriolimax campestris Binney. Tonkawa, Oklahoma.

Polygyra fraterna Say. Tonkawa, Oklahoma.

THE MOLLUSCA OF DOUGLAS COUNTY, KANSAS. GASTEROPODA.

BY G. DALLAS HANNA.

(Concluded from p. 83.)

Polygyra fraterna friersoni Pilsbry. Very rare ; a few specimens identical with specimens of this variety from southern Kansas have been found in this county.

Bulimulus dealbatus Say. This is evidently the form *liquabilis* Reeve, but I have not seen specimens of the subspecies to make comparison. It is found rather commonly on open rocky hillsides.

Pupilla muscorum Linnaeus. From river drift at Lawrence.

Pupilla blandi Morse. A few drift specimens have been picked up.

Pupilla hebes Ancey. Two specimens found in drift, one at Tecumseh and the other at Lawrence.

Pupoides marginatus Say. Common everywhere.

Bifidaria procera Say. Common in open places favorable for mollusks.

Bifidaria procera cristata P. & V. Rare this far east.

Bifidaria hordeacella Pilsbry. One specimen found in river debris at Lawrence.

Bifidaria holzingeri Sterki. Very rare ; it gives way to the form *Bifidaria holzingeri fordiana* Sterki. Found in the woods of Blue Mound and elsewhere.

Bifidaria contracta Say. Common in timber lands.

Bifidaria armifera Say. Abundant.

Bifidaria pentodon Say. Found sparingly in the woods.

Bifidaria tappaniana C. B. Adams. Common on Blue Mound.

Bifidaria agna P. & V. Very rare ; two specimens from drift debris of the Kansas river at Lawrence.

Vertigo ovata Say. Apparently rare.

Vertigo milium Gould. A few specimens came from Blue Mound.

Vertigo tridentata Wolf. Our commonest *Vertigo*; found on Blue Mound and in river drift at various places.

Strobilops affinis Pilsbry. Common in woody places.

Vallonia parvula Sterki. Very common where there is no shade.

Vallonia costata Müller. Drift specimens only have so far been found.

Cochlicopa lubrica Müller. Common on Blue Mound.

Agriolimax campestris Say. Not common.

Agriolimax agrestis Linnaeus. This is the common slug of Kansas.

Vitrea rhoadsi Pilsbry. This form is rather common in the woods.

Vitrea indentata umbilicata Cockerell. Abundant everywhere.

Vitrea milium Morse. This species is associated with *Z. minuscula*, but is less common in most places.

Zonitoides arborea Say. Abundant in all woods.

Zonitoides nitida Müller. Apparently a rare species and locally distributed. I have found it only near Lake View.

Zonitoides minuscula Binney. This species is common in open woodlands.

Zonitoides minuscula alachuana Dall. Found associated with the typical form but less common.

Zonitoides singleyana Pilsbry. A species of the open plains.

Zonitoides nummus Vanatta. Found at Lake View and at Blue Mound, in the woods on each occasion.

Euconulus chersinus trochulus Reinhardt. Found in the woodlands with *Z. nummus*.

Philomycus carolinensis Bosc. Rather common on Blue Mound. A number of specimens have been taken.

Pyramidula alternata Say. Abundant in wooded and rocky places.

Pyramidula asteriscus Morse. A few specimens have come from Blue Mound and more from river débris at various places in the county.

Helicodiscus parallelus Say. This species lives in colonies around the limestone bluffs altogether.

Helicodiscus eigenmanni Pilsbry. One specimen was picked out of drift from Lecompton; it probably washed there from farther west.

Punctum pygmaeum Draparnaud. Apparently rare, as it has only been found once, and then in river drift from Lawrence.

Succinea avara Say. Not common.

Succinea grosvenori Lea. Found in colonies in wet places.

Succinea rusticana Gould. Generally distributed, but it has not been found common.

Succinea stretchiana Bland. This is our common *Succinea*.

Carychium exile Lea. A colony of this species was found near the top of Blue Mound.

Helicina occulta Say. Drift specimens have been found at Lawrence in a situation that would lead one to suspect that it is a resident.

Lymnea techella Haldeman. Abundant in a drainage ditch south of Lawrence.

Lymnea columella chalybea Gould. Found in the Whitcomb greenhouse at Lawrence on the sides of flower-pots.

Lymnea dalli Baker. Found in the greenhouse with *L. columella chalybea* and also in river drift.

Lymnea elodes Say. One drift specimen is from Lawrence.

Lymnea obrussa Say. Rather common in a watercress spring west of Lawrence.

Lymnea parva Lea. Only a few specimens from river débris have been found.

Lymnea reflexa Say. This form used to be very common in Lake View, but the flood of 1903 swept almost all away.

Lymnea reflexa crystalensis Baker. Not common in this county.

Planorbis bicarinatus Say. Lake View and Rock Creek.

Planorbis trivolvus Say. Abundant in all ponds.

Planorbis deflectus Say. Lake View.

Planorbis parvus Say. A few specimens were found along the Kansas River.

Physa anatina Lea.

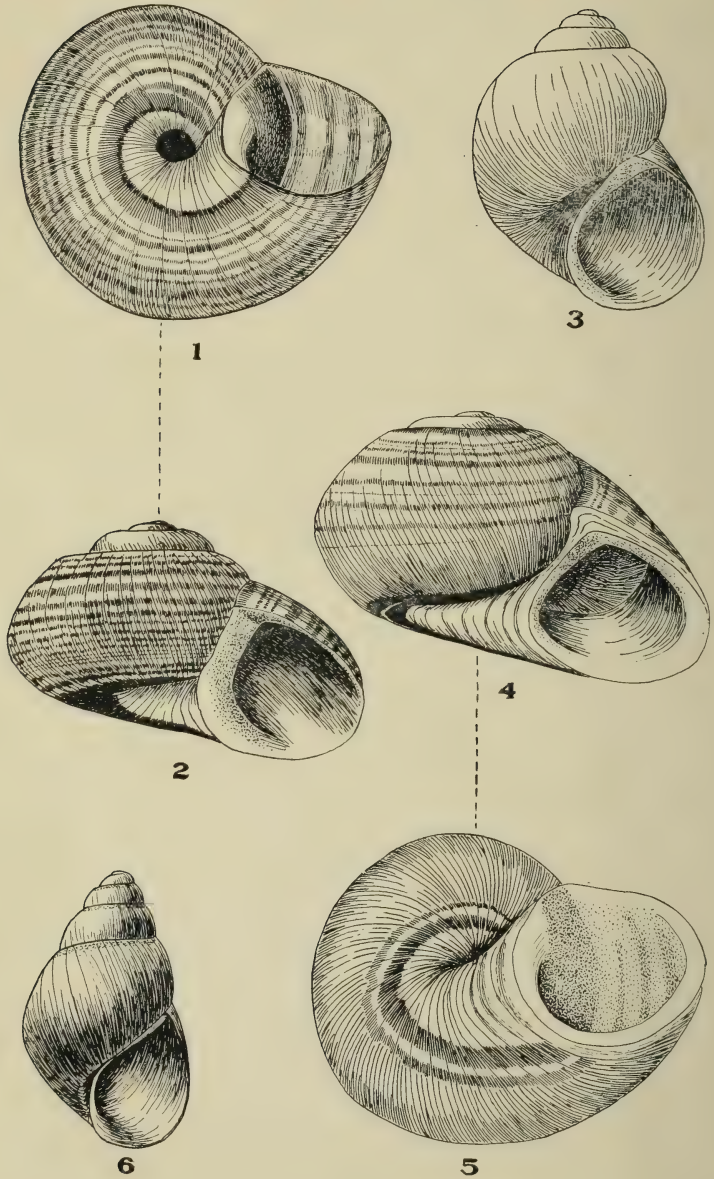
Physa oleacea Tryon. These two species were identified by Mr. Bryant Walker. All the specimens of this county seem referable to them.

Amnicola cincinnatiensis Lea. Found in mud creek commonly.

Amnicola limosa Say. A single dead shell from the Kansas River.

Campeloma decisum Say.

Campeloma subsolidum Anthony. These two forms live abundantly in the Wakarusa Creek, but are easily distinguishable.



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No. 8

NEW AMNICOLIDÆ OF THE PANUCO RIVER SYSTEM, MEXICO.

BY HENRY A. PILSBRY.

In the course of Mr. A. A. Hinkley's expedition to the Panuco river region in 1907 he found *Potamopyrgus coronatus* (Pfr.), *Paludetrina tampicoensis* Pils., *Cochliopa riograndensis* Pils. & Ferr., and an *Amnicola* identified as *A. guatemalensis* C. & F., but which on further study turns out to be a new species. Several more forms are now added by the expedition of 1909, among them a southwestern representative of *Somatogyrgus* and some very handsome though small species of *Cochliopa*.

In the works of Crosse and Fischer and of von Martens, the American spinose Amnicoloids are referred to the genus *Amnicola*, in the belief that *Potamopyrgus* does not occur in America. This idea is in my opinion wholly erroneous. The American *P. coronatus* (Pfr.) has the dentition and the *viviparous reproduction* of the New Zealand type of *Potamopyrgus*. In New Zealand, as in America, both spinose and smooth forms occur. There is no conchological difference. No *Amnicola* is viviparous, and there is a perceptible if small difference in the shells, which are more compact and more solid in *Amnicola*.

The genus *Potamopyrgus* occurs also in the Antilles, South America, West Africa and Tasmania. Perhaps the British *Hydrobia jenkinsi* belongs to this genus. If viviparous it certainly does; but I have not investigated the species. Like *Planorbis*, *Viviparus*, *Lymnæa* and some other fresh-water genera, it seems that *Potamopyrgus* has a very wide geographic distribution. In female *Potamopyrgus* one finds the young shells as in the genus

Viviparus. This character serves to differentiate it from *Paludetrina*, which the smooth phase resembles in shell structure.

AMNICOLA CROSSEANA n. sp. Pl. ix, fig. 6.

The shell is perforate, ovate-conic, corneous, smooth, the growth-lines being scarcely visible. Whorls 5, the first very minute, the rest not very convex; suture but slightly impressed, having a gray border (by transparency) below. Umbilical region defined by an angle. Aperture ovate, slightly oblique. Peristome thin, narrowly olive-edged, represented by an adnate transparent callus on the parietal wall, which is rather long.

Length 3.1, diam. 2, length of aperture 1.6, width 1.1 mm.

Found only in ponds at La Barra, near Tampico.

This species was taken in considerable numbers. It has some resemblance to *A. guatemalensis* Crosse & Fischer (*Paludina hyalina* Morelet, not Anton), but on comparing a specimen received from Morelet it is noticed that *guatemalensis* has much more convex whorls and a shorter more rotund aperture. *A. guatemalensis* is very closely related to *A. panamensis* Tryon. I doubt whether the two forms are specifically distinct.

A. crosseana, named for M. Hippolyte Crosse, is distinct from species of the Texan region by its lengthened shape, rather pointed apex, the weak convexity of the whorls, the long adnate parietal callus and the angulation around the umbilical region. With the milky corneous examples there are many of a brown or russet tint, probably owing to a thin ferrous incrustation.

Amnicola comalensis Pils. & Ferr. from Texas described in the Proc. Acad. Nat. Sci., Phila., 1906, p. 171, fig. 37, is a much stouter shell than *A. crosseana*. In the description the length was given by error as 3.9 mm. It should have been 2.9 mm.

SOMATOGYRUS MEXICANUS n. sp. Pl. ix, fig. 3.

The shell is perforate, globose, higher than wide, corneous, smooth, solid but rather thin. Whorls $4\frac{1}{2}$, strongly convex, parted by a deep suture, rather slowly increasing at first, but at the last whorl very rapidly enlarging. The last whorl is very convex, and descends more rapidly near the aperture. The aperture is ovate, subangular above. The outer lip is a little curved forward in the middle, or in other words, retracted above, thin-edged. The inner

lip is arcuate below, straightened above, heavily calloused in adults, especially above, and in contact with the preceding whorl only for a very short distance. There is a somewhat flattened umbilical area below the perforation, closely marked with growth-striæ, and bounded by an angle, which is sometimes not very distinct.

Length 5.3, diam. 4.5, aperture 3.1 mm.

Length 5, diam. 4.5, aperture 3.1 mm.

Coy river, on the road to Tampamolón; State of San Luis Potosí. Types no. 99023 A. N. S. P.

This is the first *Somatogyrus* from west or southwest of the Mississippi river system.

COCHLIOPA COMPACTA n. sp. Pl. ix, figs. 4, 5.

The shell is depressed, solid, rimate, pale greenish olive, encircled with few or many dark olive or blackish lines and narrow bands, and sometimes a few cream-white bands. Spire convex, very narrow when viewed from above. Whorls $3\frac{1}{2}$ to nearly 4, the early ones smooth, the last very wide, rounded, sculptured with low spiral threads or nearly smooth, descending to the aperture. The aperture is rotund-ovate, angular above, the outer lip slightly thickened, columellar and parietal margins thick. The umbilical area behind the columellar lip in fully adult shells is white and wide, the basal rimation either long or rather short.

Alt. 2, diam. 3.9 mm.

Choy river at the cave, south of Las Palmas, State of San Luis Potosí, Mexico.

This species is closely related to *C. picta*, differing by the larger aperture, compressed and generally closed umbilical region, and the peculiar area behind the columellar lip of adult shells. It was taken in considerable quantity.

The figures represent one of the most common color-forms. Other examples have lines and bands over the base also; and in some these markings are reduced to a few wide bands.

COCHLIOPA RIOGRANDENSIS Pils. & Ferr.

Valles river at Valles and Willis's ranch; Ganina river near Rascon. It is an abundant and variable species. In some examples the last whorl becomes free at the aperture, reminding one of the small shell described as *Valvata micra*. That species may prove to be a *Cochliopa*.

COCHLIOPA PICTA n. sp. Pl. ix, figs. 1, 2.

The shell is depressed, solid, narrowly umbilicate, there being a minute perforation and a curved, semicircular rimation where it enlarges at the last whorl; inner whorls pale olivaceous-corneous, the last encircled with many dark olive spiral lines and bands, which are almost imperceptibly raised. The spire is convex, and narrow viewed from above, the last whorl being very wide. Whorls $3\frac{1}{2}$, the last rounded, indistinctly plicate radially around the umbilicus. The aperture is rounded-ovate, angular above; outer lip thin; columellar lip rather heavily calloused; parietal wall short, calloused. Alt. 2.1, diam. 3.7 mm.

Coy river, near the ford on road to Tampamolón, State of San Luis Potosí, Mexico. A few smaller specimens were taken in the Ganina river near Rascon.

This species differs from *C. riograndensis* by its much smaller umbilicus, opening out only at the last half whorl. The spire is also more depressed. Many specimens were taken.

RECTIFICATION OF THE NOMENCLATURE OF THE NUDIBRANCHIATA
IN LERMOND'S "SHELLS OF MAINE."

BY FRANCIS N. BALCH.

A meritorious attempt by Norman Wallace Lermond to list the mollusca of Maine has recently appeared under the title indicated above, and has been noticed in a recent number of the NAUTILUS.

Considering the confused state of our knowledge (or rather ignorance, for knowledge we have little) of the Nudibranchs, it is scarcely a reflection on Mr. Lermond that his list of this most interesting but neglected group reflects the state of knowledge of nearly forty years ago. It is a painful admission that the additions to our knowledge since that time have been few and scattering, but such as they are they should be recognized; and Mr. Lermond's list, otherwise of considerable use as almost the only recent list of Nudibranchs from the northeast coast, might do mischief if allowed to stand uncorrected in this particular—hence the following remarks.

Aeolis purpurea Stimps. in all probability is *Cratena pustulata* (A. & H.), as Bergh believed, and should be written accordingly, though with a query.

Aeolis stellata Stimps. is a *Coryphella* only very doubtfully distinct from the same author's *mananensis*, which in turn is either a synonym or a variety of Johnston's *rufibranchialis*—see a recent article by me in the NAUTILUS.

Eolis (*Cavolina*) *salmonacea* Couth. (now universally but perhaps erroneously treated as a *Coryphella*) although omitted from this list, has been reported by Verrill from Eastport. But what Verrill understood that species to be no one can say except that it certainly was not the same as what European authors understand. But then, what European authors understand is just as certainly not what Couthouy meant! The fact is the true *salmonacea* is entirely enigmatical. However it should appear in the list.

Dendronotus arborescens Müller should be *D. frondosus* (Ascanius)—this change has been universally adopted.

Cadlina repanda (A. & H.) should be *C. obvelata* (Müller)—same remark as last.

Issa lacera should be credited to (Abildgaard) instead of (Müller).

Doris bifida Verrill (entered twice in the list, once as a variety of *Acanthodoris pilosa* and once as a variety of *A. stellata*), *Doris stellata* Gmelin and *Acanthodoris citrina* Verrill, are all synonyms of *Acanthodoris pilosa* (Abildgaard); while *D. ornata* Verrill is at most a variety.

It is extremely doubtful whether *Lamellidoris diaphana* (A. & H.) really occurs on our coast. The common Maine form I believe to be *L. aspera*, mentioned below. However it correctly appears in this check list.

Probably nothing can be done with *Lamellidoris tenella* and *L. grisea* but to retain them as Mr. Lermond has done, though they are practically nomina nuda.

Ancula sulphurea Stimps. is a variety of *A. cristata* (Alder).

With regard to *Idaliella pallida* (Ag.) Gould, several errors appear to have crept in. No *Idaliella* occurs in Maine so far as I am aware. The only eastern American members of the sub-genus known, I think, are *pulchella* A. & H., found at Salem, Mass., in 1879, by Emerton, and *modesta* Verrill from Vineyard Sound and vicinity. There is, however, a *Lamellidoris pallida* of Ag. the distribution of which is such as Mr. Lermond's list gives, and of which *Proctaporia fusca* Stimps. is a synonym as given. The citation in synonymy of *Amoeroecium pallidum* Verrill 1873, is, of course, in-

advertence. *Amoeroecium* is a genus of compound Ascidians. Verrill, in his Rep. on Invert. of Vin. Sound, 1873, notices (on different pages) both *Amoeroecium pallidum* and *Onchidoris pallida* which latter is of course what Mr. Lermond intended to cite.

Pallida is, however, a synonym of *Lamellidoris aspera* (A. & H.). The entry, therefore, should stand as *Lamellidoris aspera* (A. & H.) with *Proctaporia fusca* Stimps. 1860, *Doris pallida* Ag. 1849, and *Onchidoris pallida* "Verrill," Verrill 1870 and 1873, in synonymy.

Lamellidoris muricatus should be written *muricata*.

Palio lessoni should be written *lessonii*.

UNIONIDÆ FROM SOUTHEASTERN ARKANSAS AND N. E. LOUISIANA.

BY E. G. VANATTA.

Mr. Clarence B. Moore collected the following species of *Unionidæ* while on an archaeological expedition during the winter of 1908-09.

Quadrula ebena Lea was everywhere the most abundant species. Dr. Pilsbry agrees with me in considering *Unio dombeyana* Val. in Humboldt et Bonpland, Rec. Obs. Zool., 1833, Vol. 2. p. 227, pl. 53, f. 1, a valid variety of *Quadrula heros* Say, instead of a synonym of *Q. trapezoides* Lea.

The originally varietal name *obesa* Simps. is used instead of *Tritogonia tuberculata* Bar. as the name *tuberculata* is preoccupied in *Quadrula*. *Unio tuberculatus* Barnes was grouped with *U. apiculatus* (now referred to the genus *Quadrula*) by Pilsbry in 1891 (NAUTILUS V, p. 76); a position confirmed by Dr. H. von Ihering in 1901 (NAUTILUS XV, p. 39), and by Dr. Arnold Ortmann this year. (Ann. Carnegie Mus., 1909, Vol. 5, p. 193.)

All the specimens of *Quadrula trapezoides*, *pyramidata*, *ebena*, *obesa* and *Plagiola securis* were smaller than the usual size.

I. Pyles Landing, Ouachita River, Calhoun Co., Arkansas.
Obovaria castanea Lea and *Anodonta opaca* Lea.

II. Near Pigeon Hill, Ouachita River, Union Co., Arkansas.
Obovaria castanea Lea.

Plagiola securis Lea.

" *elegans* Lea.

Strophitus edentulus Lea.

Unio subgibbosus Lea.

Quadrula plicata Say.

" *heros dombeyana* Val.

" *metanevra* Raf.

" *asperrima* Lea.

" *obesa* Simps.

<i>Quadrula sphaerica</i> Lea.	<i>Quadrula pyramidata</i> Lea.
“ <i>nodifera</i> Conr.	“ <i>ebenus</i> Lea.
“ <i>trigona</i> Lea.	

III. Caryville Landing, Ouachita River, Union Co., Arkansas.

<i>Lampsilis hydianus</i> Lea.	<i>Quadrula perplicata</i> Conr.
“ <i>ligamentinus gibbus</i> Simps.	“ <i>heros dombeyana</i> Val.
“ <i>fallaciosus</i> (Sm.) Simps.	“ <i>metanevra</i> Raf.
<i>Obovaria castanea</i> Lea.	“ <i>asperrima</i> Lea.
<i>Plagiola securis</i> Lea.	“ <i>nodifera</i> Conr.
<i>Unio gibbosus</i> Bar.	“ <i>trigona</i> Lea.
“ <i>subgibbosus</i> Lea.	“ <i>pyramidata</i> Lea.
	“ <i>ebena</i> Lea.

IV. Seven Pine Landing, Bayou Bartholomew, Morehouse Parish, Louisiana. *Quadrula trapezoides* Lea.

V. Alabama Landing, Ouachita River near the mouth of Basche La Pierre Creek, Union Parish, Louisiana, 12 miles in a straight line above Ouachita, Louisiana.

<i>Lampsilis ventricosus satur</i> Lea.	<i>Quadrula perplicata</i> Conr.
“ <i>ligamentinus gibbus</i> Simps.	“ <i>heros dombeyana</i> Val.
“ <i>fallaciosus</i> (Sm.) Simps.	“ <i>trapezoides</i> Lea.
“ <i>purpuratus</i> Lam.	“ <i>cylindrica</i> Say.
<i>Plagiola securis</i> Lea.	“ <i>obesa</i> Simps.
<i>Unio gibbosus</i> Bar.	“ <i>sphaerica</i> Lea.
	“ <i>pyramidata</i> Lea.
	“ <i>ebena</i> Lea.

VI. 15 miles below Monroe, Ouachita River, Ouachita Parish, Louisiana.

<i>Lampsilis ventricosus satur</i> Lea.	<i>Quadrula asperrima</i> Lea.
<i>Obovaria castanea</i> Lea.	“ <i>sphaerica</i> Lea.
<i>Quadrula perplicata</i> Conr.	“ <i>nodifera</i> Conr.
“ <i>heros dombeyana</i> Val.	“ <i>trigona</i> Lea.
“ <i>trapezoides</i> Lea.	“ <i>pyramidata</i> Lea.
“ <i>metanevra</i> Raf.	“ <i>ebena</i> Lea.

VII. White Oak Landing, Boeuf River, Franklin Parish, Louisiana.

<i>Lampsilis hydianus</i> Lea.	<i>Quadrula trapezoides</i> Lea.
“ <i>anodontoides</i> Lea.	“ <i>asperrima</i> Lea.
<i>Quadrula heros dombeyana</i> Val.	

VIII. Ouachita River, Catahoula Parish, Louisiana.

<i>Quadrula heros dombeyana</i> Val.	<i>Quadrula ebena</i> Lea.
“ <i>asperrima</i> Lea.	

IX. Black River, Catahoula Parish, Louisiana.

Lampsilis fallaciosus (Sm.)*Quadrula heros dombeyana* Val.

Simps.

" *trapezoides* Lea.*Obliquaria reflexa* Raf.

VALVATIDAE OF THE WESTERN NORTH AMERICA.

BY HAROLD HANNIBAL.

While preparing a paper on the tertiary fresh-water fossils of Western North America it became necessary to go over the literature and examine all the *Valvatidae* available. This included specimens from the type localities of *V. utahensis* and *V. virens* and part of the original lot from which *V. humeralis californica* was described. There is therefore no doubt as to the authenticity of the determinations.

Two new fossil species have turned up in the Upper Lahontan (Quaternary) of Nevada and Southern Oregon, descriptions of which are given here. In a paper on fresh-water fossils now in progress, all the species will be figured together for comparison.

On account of the complex and unsatisfactory nature of a key the following table has been devised :

Broadly umbilicate.				Narrowly umbilicate.
<i>V. whitei.</i>	<i>V. humeralis.</i>	<i>V. calli.</i>	<i>V. virens.</i>	<i>V. utahensis.</i>
Spire barely raised above body whorl.	Rather low.	Very low to very high.	Moderately high.	High.
Smooth.	Smooth.	Smooth, carinate, or marked by spiral striae.	Fine growth striae.	Smooth.
Whorls rounded beneath.	Somewhat flattened.	Rounded or carinate.	Rounded.	Somewhat angular.
?	Blue-green or brown.	?	Light to dark green.	Pellucid.

V. lewisii Currier and *V. sincera* Say have been reported from west of the Rocky Mountains, but it is probable that all the specimens will prove to be *V. humeralis*. This is a somewhat variable and badly misunderstood species. It is apparently widely distributed over all the Pacific slope.

With the exception of *V. humeralis* all the species are abundant wherever they occur, but they are sporadic. This species is also sporadic but seldom occurs in large numbers.

VALVATA HUMERALIS Say.

Valvata humeralis Say. New Harm. Diss., II, 1829, p. 244. Mexico.

Valvata humeralis californica Pilsbry. NAUT., XXII, 1908, p. 82. Bear Lake, Cal.

Small, smooth, brown or blue-green, spire variable but always low, umbilicus moderately broad, sutures slightly impressed. Characterized by a noticeable flattening about the umbilicus.

The barely matured specimens from Bear Lake do not show this character as noticeably as others in the writer's collection. This species has been identified by west coast conchologists as *V. virens*, *V. lewisii*, and *V. sincera*. The latter two can be easily eliminated but the specimens from several of the localities given with a question mark under *V. virens* may on re-examination prove to be *V. humeralis*. Not known as fossil.

DISTRIBUTION.¹

Mexico.

California.

- * Bear Lake, San Bernardino Mts. (Berry).
- * Bluff Lake, San Bernardino Mts. (Berry).
- * Soap Lake, San Benito Valley (Hannibal).
- * Pond, Likely, South Pitt Valley (Hannibal).
- Slough, De Witte, Honey Lake Valley (Hannibal).

Oregon.

- * Upper Klamath Lake (Hannibal).

Washington.

Lake Washington, Seattle (Randolph).

¹ * Seen by writer.

? Identification doubted.

Idaho.

Near Franklin (Hemphill).

Utah.

Near Salt Lake City (Yarrow and Hemphill).

VALVATA VIRENS Tryon.

Valvata virens Tryon, Proc. Acad. Nat. Sci., Phila., 1863, p. 148, pl. 1, fig. 11.

Spire moderately elevated, whorls rounded, umbilicus rather narrow, sutures moderately deep, shell marked by fine transverse striae, light green to deep green color.

It has been the custom to refer any western American *Valvata* of a green color or with an elevated spire to *V. virens*. The writer does not know of its authentic occurrence north of Clear Lake. Call's Great Basin specimens are *V. calli*. References to living specimens from northeastern California and southeastern Oregon are probably *V. humeralis*.

California.

* Clear Lake (Tryon, Cooper, Hemphill).

Alameda Co. (Cooper).

Antioch (Carlton).

* Pond near Watsonville (Laws, Hannibal).

? Willow Creek, Lassen Co. (McGregor).

Oregon.

? Grant's Lake (Cooper).

British Columbia.

? Nanaimo, Vancouver Is. (Dall).

? Lake Laggan, Rocky Mts. (Taylor).

Fossil: Santa Clara Beds (Pliocene).

Gelrich's coal mine, Santa Cruz Mts., Cal. (Cooper).

* Galabazos Canon, Santa Cruz Mts. (Hannibal).

Kettleman Beds: 10 miles east of Tulare Lake, west border of Kettleman Plains (Watts).

VALVATA UTAHENSIS Call.

Valvata sincera var. *utahensis* Call, Bull. 11, U. S. Geol. Sur., 1884, p. 44, pl. vi, fig. 1-3.

Characterized by its tabulated whorls, well elevated spire, and very narrow umbilicus, sutures moderately deep; lip slightly diagonal, usually angular below. Shell smooth, pellucid.

This species is known only from near the type locality. It reminds one of *V. piscinalis* of Europe.

Utah.

* Lehi, Utah Lake, near head of Jordan River (Call).

Fossil: Semifossil, Bonneville Basin, Utah (Call.)

VALVATA CALLI n. sp.

Valvata virens Call, Bull. 11, U. S. Geol. Sur., 1884, p. 21 (in part).

Shell varying from a high spire as in *V. virens* to a very low spire as in *V. lewisii*; sculpture, smooth, carinate tricarinate or marked by numerous spiral striae. Umbilicus rather narrow; whorls rounded in smooth or striate forms angular in carinate forms. Sutures deeply impressed in high forms, slightly in low. Type tricarinate with moderately elevated spire.

Measurements: *Type*, alt. 4.5 mm., diam. 5.5 mm., diam. of aperture 2 mm.; *flattened specimen*, alt. 4 mm., diam. 6 mm., diam. of aperture 2 mm., Marl, Upper Lahontan Quarternary, near Summer Lake, Ore. (F. M. Anderson).

Also from "Central Nevada, near R. R.," named in honor of the late Robert Ellsworth Call.

VALVATA WHITEI n. sp.

Spire depressed, barely raised above outer whorl, broadly umbilicate two whorls visible beneath; shell rather thick, smooth, marked by very faint growth lines; sutures very slightly impressed, whorls round.

Measurements: Alt. 2.5 mm., diam. 6 mm., diam. of aperture 2.5 mm., Marl, Upper Lahontan, Quarternary, near Summer Lake, Oregon (F. M. Anderson).

This species resembles a very large specimen of *V. humeralis*, but the umbilicus is much broader in specimens of a corresponding size. The species also has a much thicker shell.

Named in honor of the late Dr. C. A. White.

Stanford University, Cal.

AN APPARENTLY NEW SLUG FROM THE RIVER NILE.

BY T. D. A. COCKERELL.

The slug here described was kindly placed in my hands for determination by Professor H. M. Gwatkin, of Cambridge, England.

Veronicella nilotica, n. sp.

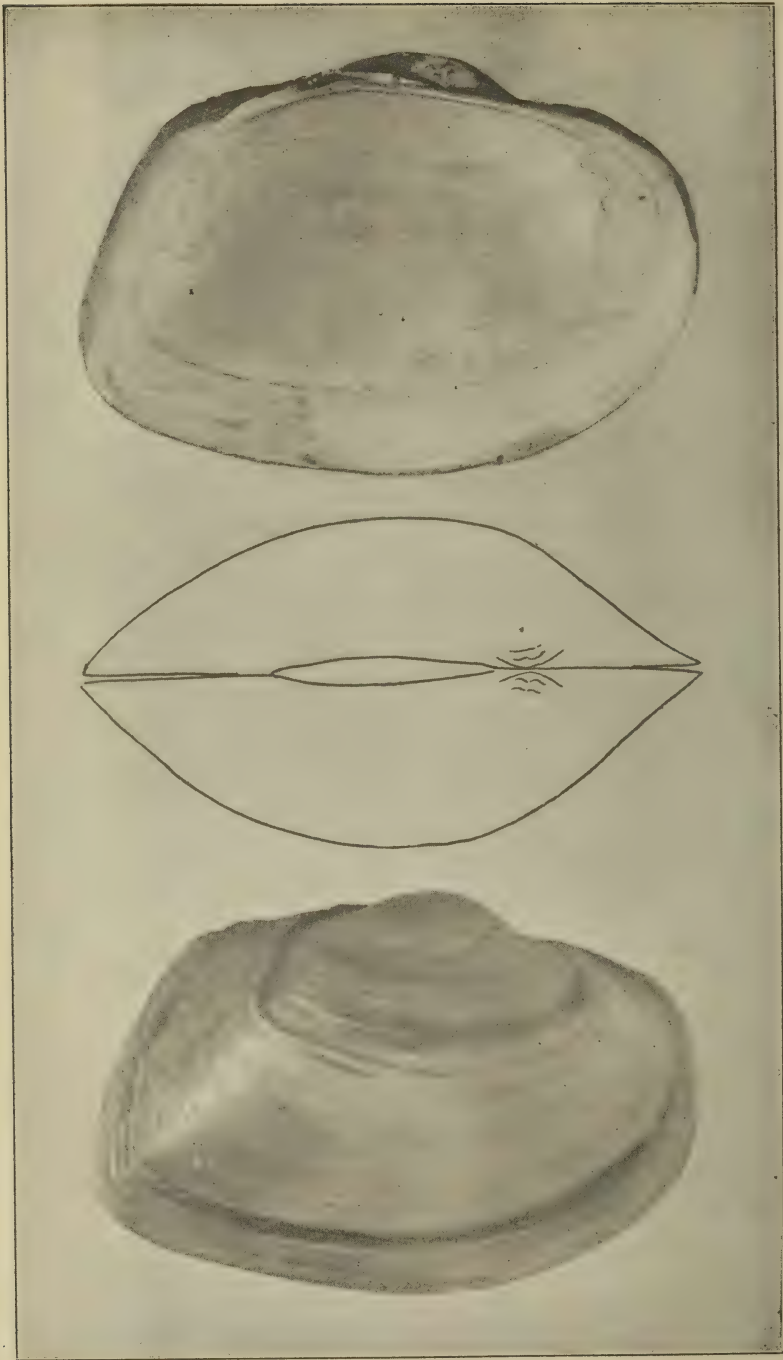
Length 43 mm., breadth $11\frac{1}{2}$; unusually narrow and parallel-sided; sole narrow, its width about 4 mm., with 16 transverse grooves (not counting the lesser ones between each pair of strong ones) in 5 mm. of length; female generative orifice $1\frac{1}{5}$ mm. from sole and $2\frac{4}{5}$ from lateral margin, its distance from head about $27\frac{1}{3}$ mm. Upper surface finely and densely tuberculate, some of the tubercles a little larger and more prominent than the others; hyponotum finely and more obscurely tuberculate. Color above (in alcohol) pale ochreous densely mottled with dark grey, the two colors about equal in amount; there is a faintly indicated pale dorsal band, on each side of which the dark mottling is heaviest; on each side at about 2 mm. from the margin, there is a very faint suggestion of a dusky stripe. The underside is pallid, with a dusky suffusion toward the sides of the hyponotum. Upper tentacles dark blue-grey. Stomach not covered by the liver, but rather broadly exposed; course and form of the intestine quite normal, the last loop traversing a little less than a semicircle; filiform glands extremely long (20 mm.), twisted right round the gut, the fully developed ones only five in number, but several other short ones at the base of the bundle.

The sole does not project beyond the end of the body. An apparently distinct species, best known by its narrow form and very long filiform glands. It extends the distribution of the genus about fifteen degrees north in Eastern Africa.

Collected by the Nile, above Khartoum, by Mr. Harold H. King, of the Wellcome Research Laboratories, Khartoum.

NOTES.

ERRATA.—“Land Mollusca of Aldabra,” in the October number. Line 4, “Conoro” is a typographical error for “Comoro.” Quotation marks should be placed at the beginning of the sentence of line 7, also of each succeeding paragraph and the finish of article.—MAXWELL SMITH.



ANODONTA DAKOTA FRIERSON.

THE NAUTILUS.

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No. 9

A COLLECTING EXCURSION NORTH OF THE GRAND CANYON OF THE COLORADO.

In August last Messrs. J. H. Ferriss and L. E. Daniels set out to extend the work begun by Ferriss and Pilsbry in 1906. From Bass' Camp they crossed the Grand Canyon of the Colorado; scaled the northern rim, explored and collected in the Kaibab and Kanab plateaux, finally reaching Kanab, in southwestern Utah. Beyond the Grand Canyon, where we had worked in 1906, this was all a virgin field conchologically. An account of their journey is here extracted from a letter received from Mr. Ferriss.

Friend Pilsbry :

The Arizona expedition of 1909 is in the offing, to use a nautical term. We felt worried until your letter was found at the end of the trip. There was some danger of getting lost in the desert in an effort to find us. A settler with a team from Mt. Trumbull a day ahead of us was three days without water and just about all in when he reached the Pipe Springs. We supposed you would come the back-door route by Salt Lake so that in coming or going you would pick up the *Oreohelix* found by Hemphill.

Unexpectedly we made the trip to Mt. Trumbull via Fredonia, Arizona and Kanab, Utah, and thus found the guide we had picked out watching for you. On a side trip I went up to the lakes in the mouth of caves along the Kanab Wash north of these villages, and from what I saw and heard it will be an interesting conchological trip along the mountains all the way to Salt Lake. It was at these cave lakes that I found *Succinea hawkinsi* of British Columbia. We heard of *Oreohelix* with a long nose but did not find them.

There must be a difference in the anatomy of different lots of *Succinea avara* sent in. We found it plentiful on the ant hills in the Antelope valley, a desert as dry as the St. Simon valley. Again on the hottest and dryest of mountain rock at the Hurricane Fault. Still again we found it with *Oreohelix* at the Big Springs in the Kaibab Mountains living in as moist a situation as we find *Polygyra multilineata*. These were of a different color, larger and more corpulent.

After this I hope to go into strange countries with U. S. Geological folios in addition to the contour maps, for the whole Mt. Trumbull country was of lava formation, barren of shells except the small truck. We need limestone and shelter in our business. The Hurricane Fault had lime but no shelter and was equally as barren. This Trumbull side-trip took half of our time and cost a lot of money, but we enjoyed it. We love the Mormons, at least their cooking, and I am now physically perfect until next August.

I will send you a map marking our collecting stations. There were 113 of these. *Oreohelix* was found at perhaps 100 stations and 80 of these are unlike any other colony in color, size or architecture, while each colony is reasonably uniform individually. We had a theory when we left the Two Springs canyon that the shells were small and dark in the higher altitudes and that they grew larger in a regular ratio as we passed to the lower levels, but in the Warm Springs Canyon the shells were largest at the upper stations and smaller at the lower. In the Snake Gulch they were smallest at the midway stations, and in Quaking Asp canyon it was a skip about between large and small. At Castle Springs, heavily shaded and in elderberry bushes, we found the largest. At Big Springs, facing the sun, moisture abundant, they were small with many albinos. Thus as to elevation, shade, moisture, soil or food we have no theory except like old-time chickens they may just happen to be large, small and middling, ring-banded, streaked or speckled. Our largest measured 30 mm. diam. and our smallest 8 mm. In the Huachucas the colonies of *Oreohelix* are of mixed forms, but the Kaibab shells are of one kind in each colony, with occasional albinos. Some of the colonies apparently divided their rock slide territory into families, designated by size or color. In one instance passing around the point of a rock, less than one hundred feet, and good traveling for snails, the colony on one side was as large again in size as those upon

the opposite side. Our prettiest shells are pure white with a green, transparent band, like Clapp's Maine find of *Helix hortensis*.

The Sonorellas were in small colonies and hard to dig. We did not find any after leaving the north rim of the Grand Canyon and the Kaibab-Powell Saddle. Powell and Kaibab plateaus are fairly level and I have never seen anything more beautiful in timber landscapes. Powell is covered with a heavy growth of large yellow pine. In the Kaibab plateau or mountains, better known in Arizona as Buckskin Mountains, blue spruce and quaking aspen with the pine lend variety to the scenery. No landscape artist in Fairmount Park could manage the grouping better than we saw it in a day and a half journey by donkey, down the Snake Gulch (known as Shinamo Canyon on the U. S. maps.)

We camped with E. W. Nelson and C. Birds of the biological survey of the U. S. Agricultural Department at Mt. Trumbull. Here we learned that the tufted-eared squirrel of the Kaibabs was *Sciurus alberti* var. *kaibabensis*. It is the largest American squirrel, black as silk with a white tail. A chattering chickaree is black throughout, and there are four chipmunks and a blue grouse. Deer were about as common as cattle, and as tame, for the Kaibabs are in a game preserve. The plains about Trumbull are populated with wild horses and these are common game, to be had for the catching.

Again I visited the Grotto [on White Creek, a branch of the Grand Canyon] and took more of the maidenhair fern. It seems to be a new species, and it so happens I am working at that group. The Grotto and creek have been filling up with gravel since you and I were there together. They are quite changed since our visit three years ago. From the Grotto, White creek keeps to the north and Muav to the west; heading in the saddle between Kaibab and Powell plateaus. So when you and I slept by the fire and found the colony of Sonorellas we were in the Muav Wash and more than half way to the north rim of the Grand Canyon. About a mile above our sleeping place, there is a fine trout stream (without fish) and cliffs a thousand feet high, with Sonorellas.

There were no mice this time at our old thousand-mouse camp on Shinamo creek.¹ We saw but two on the whole trip. Thus John had a fine orchard with leaves on the trees this time, also melons, sweet potatoes and common things in plenty. Their asbestos mine

¹ On the north side of the Grand Canyon, near the river.

is very promising but it is a long road to consumption for the copper. We found a half million dollar copper smelter in the Kaibabs and a saw mill, but only two men in the mountains besides the foresters, and these were at the saw mill. They had a wagon road to Fredonia. In fact you can wagon from the top of the Kaibab saddle to Fredonia or most any other place in that region. An auto was driven through from Salt Lake while we were there to Bright Angel, on the north side of the canyon across from the hotel. But from Bass Station to Trumbull, 125 miles, there will be no inhabitants through the winter, except Bass and John working out assessments on new mines.

Yours Truly,

JAS. H. FERRISS.

A NEW VARIETY OF LYMNÆA STAGNALIS.

BY FRANK C. BAKER.

LYMNÆA STAGNALIS LILLIANÆ var. nov.

Lymnæa stagnalis var., DANIELS, NAUTILUS XXII, p. 120 (1909).

Lymnæa stagnalis var., WALKER, Ann. Rep. Mich. Geol. Surv., 1908, 289, figure 63, No. 1 (1909).

Shell elongate-ovate, with short spire and elongated, narrow aperture, which is typically longer than the spire; whorls flattened, elongated, very flat-sided and sloping, especially the body whorl which is cylindrical; spire sharply acuminate; whorls $5\frac{1}{2}$ to 6; body whorl elongated, flattened, roundly shouldered; aperture long and narrow, slightly expanded; axis strongly gyrate; umbilical region with a very minute, narrow chink; sculpture and nuclear whorls as in *stagnalis appressa*.

Length, 42.00; width, 22.00; aperture length, 26.00; width, 13.00 mill.

Length, 40.00; width, 19.50; aperture length, 23.50; width, 11.75 mill.

Length, 39.00; width, 20.00; aperture length, 24.50; width, 11.00 mill.

Length, 37.50; width, 19.50; aperture length, 23.75; width, 12.00 mill.

Length, 40.00; width, 19.00; aperture length, 23.25; width, 11.50 mill.

Length, 28.00; width, 13.00; aperture length, 17.50; width 8.50 mill.

Types: Chicago Academy of Sciences, five specimens, No. 24554.

Type Locality: Tomahawk Lake, Oneida County, Wisconsin.

Range: Michigan and Wisconsin north of the 45th parallel of north latitude.

Records.—*Michigan*: Isle Royale; various localities. (Adams; Gleason; Walker).

Wisconsin: Quynoch Point, Eagle Bay, and other portions of Tomahawk Lake, Oneida County (Baker).

Ecology: *L. s. lillianæ* is typically an inhabitant of sandy shores, in shallow water, where it is subjected to heavy wave action, only once was a specimen found in a still-water habitat, and this instance was undoubtedly caused by drifting from its normal habitat. When any number of specimens were found, the habitat was invariably an exposed beach. Associated with *lillianæ* were *Galba emarginata* and *Planorbis binneyi*. Individuals were observed crawling over the sandy beach or attached to water-soaked logs or other shore debris.

The animal of this race exhibits two color phases, one bright yellow and the other black or grayish-black. No cause for this color dimorphism was apparent. It is not protective as both forms occupy the same area of white sandy beach.

(To be continued.)

DESCRIPTION OF A NEW SPECIES OF ANODONTA.

BY L. S. FRIERSON.

ANODONTA DAKOTA, n. sp. Plate X.

Shell elliptically rounded before (slightly cut away below) dorsal line nearly straight, base slightly curved. Posterior nearly straight, making the shell trapezoidal in outline. Epidermis straw yellow, with dark bands marking the rest periods.

Umbonal ridge angular, beaks not high, with double loop sculpture, as in *Ano. grandis*, Say.

Umbos inflated, greatest diameter of shell about $\frac{1}{3}$ from beak to base.

Length, 3; height, 1.8; diameter 1.6 (inches).

Length 76, height 51, diameter 40 mm.

Found by Mr. W. H. Over, at Ulvers Point, Clear Lake, Deuel Co., South Dakota, July 1, 1909.

To launch a new *Anodonta* is a perilous undertaking, but in this instance the novelty of the form is unmistakable. The beaks ally the shell, of course, to *Anodonta grandis*, Say. It is nearest to that form called by Mr. Anthony *A. subgibbosa* (and especially to the figure of this species shown in the *Conchologia Iconica*, which is much more characteristic than the figure in the *American Journal of Conchology*). From any form of *Ano. grandis* it differs in being more cylindrical, *i. e.*, in lacking the swelling "amidship" so often shown by *A. grandis*; in being rayless (so far as known), but especially by having its posterior point not elevated above the basal line, and by the marked truncation posteriorly, which truncation is as marked as in *Margaritana marginata* Say, and the straight posterior, and the resulting quadrilateral aspect of the shell. It is more quadrate than *Anodonta doliaris*, Lea. The lack of any *obliquity* is remarkable. Mr. Over also sent me from the same lake examples of *Anodonta grandis*, Say, and the facies of our species was strikingly dissimilar.

A NEW SYSTEM OF THE UNIONIDÆ.

BY DR. A. E. ORTMANN, CARNEGIE MUSEUM, PITTSBURGH, PA.

Since October, '09 the present writer has been engaged in the study of the anatomy of the soft parts of the *Unionidæ* of Pennsylvania, collected during the last four years. The material at hand being very rich, it was possible to make out the structure of most of our species, and the results obtained are rather satisfactory, and are apt to furnish new principles for the systematic arrangement of the species.

Simpson (Pr. U. S. Nat. Mus. 22, '00). in his system, has indicated some of the essential principles of classification, in fact, the first pointed out *the* most important feature, the shape of the *marsupium*, Yet this system must be changed considerably, if it is to represent the natural affinities. This is due chiefly to the fact, that Simpson. on the one hand, had rather insufficient material, and on the other, that he did not go into microscopic detail.

Some corrections of Simpson's system have been advocated by Sterki (Amer. Naturalist 37, '03 p. 103 ff.), and, generally, I find that these are well supported. Yet there are other differentiations in structure, which have been overlooked hitherto, and which are of prime systematic value.

The most important (and gratifying) result of my investigations is, *that the gills or parts of gills, which serve as marsupium during the breeding season, are permanently differentiated in their anatomical structure from those gills (or parts of gills), which never serve as marsupium.* Thus it is possible to recognize the type of marsupium of any species, if only sterile females are at hand.

My investigation will be published in full in the "Memoirs of the Carnegie Museum," amply illustrated by figures of the structures discussed. Although I am not quite done yet, and although I hope to secure additional material next summer, I think it advisable to publish my preliminary results as soon as possible, in order to direct the attention of the collectors to those genera, which I have not been able to investigate. It would be desirable for anybody, who intends to collect *Unionidæ* next summer, to make up his mind from the beginning, that shells without the soft parts are not the thing that is wanted, but that the soft parts, at least of some specimens, should always be preserved in alcohol.

The family *Unionidæ*, in Simpson's sense (l. c., p. 514, 515, 516), is accepted. Simpson divides it into two subfamilies, of which one, *Hyriinæ* (= *Hyrianæ* Swains., Simpson, pp. 515 and 806), is extralimital, and which cannot be discussed at present. The other is the *Unioninæ* Swains. All our North American forms belong to the latter. But I think they should be divided into four groups, which I would designate as subfamilies. Thus, disregarding the *Hyriinæ*, the *Unionidæ* are divided into four subfamilies, as shown below.

In the following I shall give a systematic arrangement of the Pennsylvanian species. Of the characters, I have given the most important ones of the soft parts for the subfamilies, and for the genera where necessary. It is not my intention to go into any detail, since further investigations may possibly necessitate minor changes in the arrangement of the genera. Some notes are appended at the end, in order to explain the most striking changes introduced here.

1. Subfamily: MARGARITANINÆ.

Gills *without well-defined water tubes*; connections of the two laminae by irregularly scattered prominences, but not by septa. (This is a most remarkable character, in which *Margaritana* differs from all other genera.) Supra-anal opening not separated from the anal opening. Diaphragm (posterior part of gills, separating anal and branchial openings) of peculiar shape: *the outer lamina of the outer gill is free from the mantle for a considerable distance*. Inner lamina of inner gills free from the abdominal sac. No papillæ on edge of mantle in front of branchial opening. (Marsupium and glochidia unknown to the writer.)

Genus and species: *Margaritana margaritifera* (L.).

2. Subfamily: UNIONINÆ.

Gills with rather *well-defined water tubes*, the latter formed by septa, which run the whole width of the gill, parallel to the gill-filaments. Supra-anal opening not separated or (generally) separated from the anal, the closed part rather short. Diaphragm normal (*i. e.*, outer lamina of outer gills connected with the mantle to their posterior end). Inner lamina of inner gills always free from abdominal sac. No papillæ on mantle edge in front of branchial opening. *Marsupium formed by both gills or only by the outer gill; edge of marsupium always sharp* (not distending). Water tubes not divided in the gravid female. *Glochidia* semioval or semicircular, without spine.

1. Genus: *Quadrula* (Raf.) Ag. (restr.). Both gills (inner and outer) serving as marsupium.

Species: *subrotunda* (Lea) [and var. *kirtlandiana* (Lea)]—*rubiginosa* (Lea) [and var. *trigona* (Lea)]—*pustulosa* (Lea)—*metanевра* (Raf.)—*cylindrica* (Say)—*tritogonia* (Ortm)¹—*undulata* (Barn.).

2. Genus: *Rotundaria* Raf. (as subgenus). Outer gills only serving as marsupium. Supra-anal opening not separated from the anal. Also with peculiar shell characters.

¹ *Quadrula tritogonia* Ortm. = *Tritogonia tuberculata* (Barn.) of Simpson. The nomenclature of this species remains to be settled. Since *Qu. tuberculata* (Raf.) is now removed from the genus *Quadrula*, the specific name *tuberculata* might become available. *Qu. lachrymosa* (Lea) probably is also a true *Quadrula*.

Species: *tuberculata* Raf.

3. Genus: *Pleurobema* (Raf.) Ag. (enlarged). Outer gills serving as marsupium. Supra-anal separated from the anal.

Species: *cooperiana* (Lea)¹—*ætopus* (Green).

obliqua (Lam.) [including the form *pyramidata* (Lea) and the var. *coccinea* (Conr.).²

clava (Lam.).

4. Genus: *Unio* Retz.³

Species: *crassidens* (Lam.)—*gibbosus* (Barn.)—*complanatus* (Dillw.)—*productus* (Conr.) (Fulton Co., Pa.).

3. Subfamily: ANODONTINÆ.

Water-tubes similar to those of the *Unioninæ*, only less regular at base of gills, chiefly so in the male. Supra-anal opening well separated from the anal; sometimes the connection of the mantle margins is very long. Diaphragm normal. Inner lamina of inner gills generally free from the abdominal sac, sometimes with the tendency to become connected with it, or entirely connected. No papillæ on mantle edge in front of branchial opening. *Marsupium* formed by the outer gills; edge of marsupium, when charged, distending, the thickened tissue forming the edge stretching out in a direction transversal to the gills, but not bulging out beyond the edge of the gill (or only slightly so). Water-tubes in the gravid female *divided longitudinally into three tubes*, one lying toward each face of the gill, the third in the middle; only the latter contains eggs or embryos, and is much larger than the outer tubes. This division into three parts is not present in the sterile female. *Glochidia* subtriangular, with one spine at the tip.

1. Genus: *Alasmidonta* Say.⁴

¹ *Pleurobema cooperiana* (Lea) (= *Qu. cooperiana* of Simpson) surely groups with *Pl. ætopus*.

² *Pl. obliqua*, *pyramidata* [and also *plena* (Lea)] form a natural group by themselves, and probably are one and the same species. *P. pyramidata* is only an extreme variation of *P. obliqua*, with which it occurs, while *coccinea* is a good ecological variety, which, however, runs into *obliqua* at certain localities.

³ The characters of the soft parts of *Unio* are practically identical with those of *Pleurobema*. A distinction is possible only by shell characters.

⁴ The genera of the *Anodontinæ* are distinguished chiefly by shell characters, but it seems as if *Alasmidonta* and *Strophitus* are more closely allied to each other, and then again *Symphynota*, *Anodontoides* and *Anodonta*.

Species: *heterodon* (Lea)—*marginata* (Say) [and var. *varicosa* (Lam.)]—*undulata* (Say).¹

2. Genus: *Strophitus* Raf.²

Species: *undulatus* (Say) [= *edentulus* (Say)].

3. Genus: *Symphynota* Lea.

Species: *compressa* (Lea)—*viridis* (Conr.).³

costata (Raf.)—*complanata* (Barn.).

4. Genus: *Anodontoides* Simps.

Species: *ferussacianus* (Lea) (and var. *subcylindraceus* (Lea)).

5. Genus: *Anodonta* Brug.

Species: *cataracta* Say.—*grandis* Say (with several varieties)
imbecillis (Say.)⁴

4. Subfamily: LAMPSILINÆ.

Water tubes similar to those of the *Unioninæ*. Supra-anal opening separated from the anal, rarely entirely closed. Diaphragm normal. Inner lamina of inner gills rarely more or less free from abdominal sac, generally entirely connected with it. Mantle edge in front of branchial opening crenulated, *papillose*, or *with a peculiar flap*. *Marsupium formed by the outer gill, or (mostly) by the posterior part of the outer gill* (sometimes only a section of the latter is used for the marsupium). *Edge of marsupium, when charged, rounded, distended and bulging out beyond the ends of the branchial filaments*. Water tubes in the gravid female simple. *Glochidia* generally of the type of the *Unioninæ*, rarely different, and rectangular with two spines.

1. Genus: *Ptychobranhus* Simps.⁵

Species: *phaseolus* (Hildr.)

¹ *Alasmid. heterodon* stands by itself, while *marginata* and *undulata* are more closely related.

² The marsupium of *Strophitus* is very peculiar and complex, and cannot be explained in a few words and without figures. The discharge of the "placentæ" ("ovisacs" of Simpson) is *not* through the walls of the gills, as Simpson indicates (l. c., p. 616).

³ *Symphynota compressa* and *viridis* are *hermaphrodites*!

⁴ As already Sterki has shown, *Anodonta imbecillis* is a *hermaphrodite*, which I am able to confirm. I know another species of *Anodonta*, from Texas, which is also hermaphroditic; it groups with *imbecillis*, and belongs possibly under *A. henryana* Lea (or may be a new species).

⁵ The peculiar character of the marsupium of *Ptychobranhus* is well known; this form reveals what is essential in the *Lampsilis*-type of marsupium. The genus *Cyprogenia* Ag., which I had no chance to investigate, very likely should follow after *Ptychobranhus*.

2. Genera : *Obliquaria* (Raf.) Simps.—*Plagiola* (Raf.) Ag.—*Obovaria* (Raf.)¹

Species : *Obliquaria reflexa* Raf.

Plagiola securis (Lea)—*elegans* (Lea).

Obovaria retusa (Lam.)—*circulus* (Lea)—*ellipsis* (Lea).

Obovaria ligamentina (Lam.)²

3. Genus : *Proptera* Raf.³

Species : *gracilis* (Barn.)—*alata* (Say).

4. Genus : *Carunculina* Simps. (subgen.)

Species : *parva* (Barn.)⁴

5. Genus : *Micromya* (Ag.) Simps.

Species : *fabalis* (Lea.)⁵

6. Genus . *Lampsilis* Raf. (restr.)⁶

Species : *iris* (Lea)—*nasuta* (San)—*recta* (Lam.)⁷

luteola (Lam.)—*radiata* (Gmel.)—*orbiculata* (Hldr.)⁸

¹ These three genera are practically identical with regard to their anatomy, only *Obliquaria* is distinguished by the marsupium consisting only of a few ovisacs. They may be distinguished by shell characters, which, however, are hard to define. All the species enumerated here are characterized by the absence of papillæ or flaps on the mantle edge in front of the branchial opening.

² A final arrangement of the genera must be left for the future.

³ *Obovaria ligamentina* = *Lampsilis ligamentina*. This species undoubtedly belongs into this group, and not with the true *Lampsilis*.

⁴ *Proptera*, as defined by Sterki. *P. alata* is distinguished by its peculiar glochidia (rectangular, with two spines). But *P. gracilis*, which agrees in all other respects, has different glochidia; they are of the normal *Lampsilis*-shape, but much smaller.

⁵ *Car. parva* has the inner lamina of the inner gills not connected with the abdominal sac, and the supra-anal opening is entirely closed; for the rest it resembles the *iris*-type of *Lampsilis*.

⁶ *Micromya fabalis* agrees well with the *iris*-type of *Lampsilis*, but the inner lamella of the inner gill is partly free from the abdominal sac. Both *Carunculina* and *Micromya* form a transition from the more primitive forms to the typical *Lampsilis*. Further study possibly will throw more light upon these forms.

⁷ *Lampsilis* is characterized by the development of peculiar structures on the mantle edge. The first group has papillæ, the second a flap.

⁸ Also *Lampsilis vibex nigrina* (Lea) from Florida and *L. anodontoides* (Lea) from Texas have been investigated, and prove to belong to this group.

⁹ *L. orbiculata* is not at all related to *L. ligamentina*, as Simpson thinks, but it belongs to the *ventricosa* group of *Lampsilis*, for it has a well-developed flap on the mantle edge.

cariosa(Say)—*multiradiata*(Lea)—*ventricossa*(Barn.)
and var. *ovata* (Say).

7. Genus : *Truncilla* Raf.¹

Species : *triquetra* Raf.—*perplexa rangiana* (Lea).

NOTES AND NEWS.

THE Wendell Phillips High School, Chicago, in its regular Zoology work is doing things unique with the mollusca. Each pupil is required to make a "cigar box" collection of shells. These are fixed up nicely and covered with glass. The specimens are named on inside of lid and an exhibition takes place to which parents and friends are invited. This year over 200 boxes and 8000 specimens were exhibited.

The students under the direction of Mr. E. E. Hand, the teacher are urged to make a thorough study of their own region and in co-operation with the Agassiz Association are arranging for exchanges with high schools and individual collectors all over the world. Anyone interested is invited to correspond.—E. E. HAND.

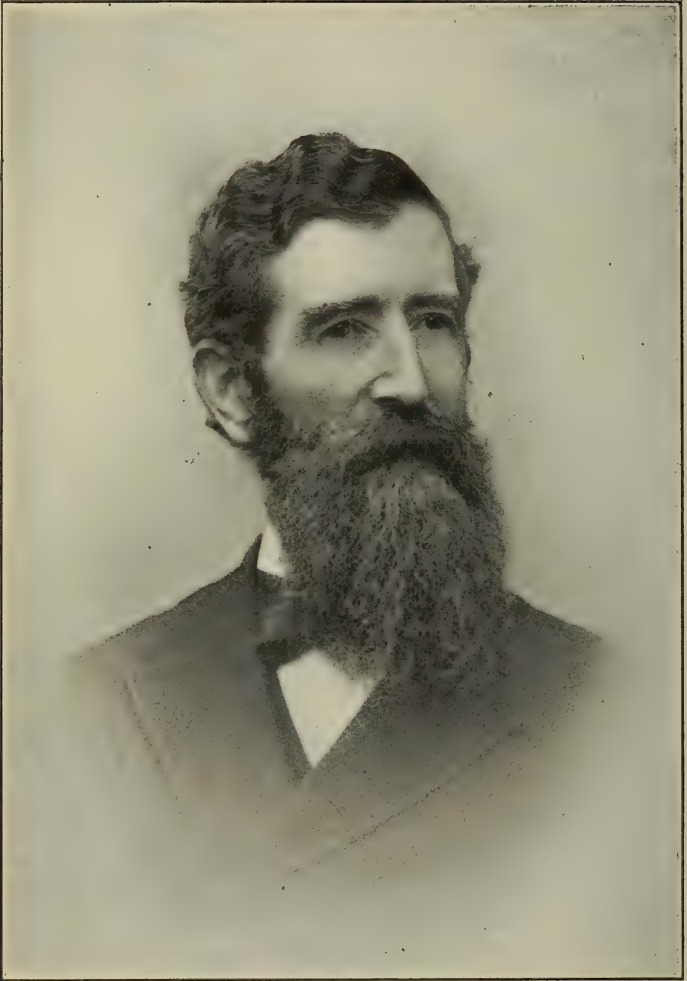
IT is with sorrow we record the death of Mr. John Ford, at his home in Philadelphia, on January 10, 1910. An obituary will appear in March number.

WE also regret to announce the death of Dr. John H. Britts of Clinton, Missouri, which occurred November 14, 1909.

Lymnæa cubensis aspirans, n. subsp. The shell differs from *L. cubensis* by its much longer spire of very convex whorls. Length 12, diam. 6, length of aperture 6 mm.; whorls 6. Barbadoes. Types No. 85455 A. N. S. P. This is not *Limnæa barbadensis* Sowerby, Conch. Icon., xviii, pl. 14, f. 100. I have seen no Antillean species resembling that figure.—H. A. PILSBRY.

WE learn with regret of the death of Dr. Kakichi Mitsukuri, the eminent Japanese zoölogist, on September 16.

¹Shell characters peculiar, and also mantle edge, and in some respects also the marsupium. The two species differ considerably, and the two subgenera of Simpson (*Truncilla* and *Pilea*) should perhaps be elevated to the rank of genera.



JOHN FORD.

THE NAUTILUS.

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No. 10

A NEW FOSSIL MITRA FROM WEST FLORIDA, AND A NEW EOCENE ASTARTE.

BY T. H. ALDRICH.

MITRA (CHRYSAME) WALTONENSIS, n. sp. Pl. XI, fig. 1.

Shell rather solid, thick; apex scarcely pointed. Whorls six, three smooth, balance cancellated and shouldered, suture deep; varices near the aperture predominating over the spirals and appressed to the suture. Aperture with strong outer lip which is serrated on its outer edge and showing seven or eight strong lirations within; inner lip curved and covered with a strong enamel which spreads over part of the body whorl, two strong quadrangular folds on the lower central part and a pointed tooth near the posterior part of the aperture, base rounded, shell slightly umbilicated.

Height, 16 mm.; breadth, 9 mm.; length of aperture, 9 mm.

Locality: Shoal River bed, West Florida. Oligocene of Dall.

Remarks.—This is another Pacific Ocean form that adds to the evidence of a channel between the two oceans during the Tertiary period.

ASTARTE NEWTONENSIS, n. sp. Pl. XI, figs. 2, 3.

Shell small, rounded, nearly equilateral; beaks small, lunule rather long, the concentric ribs dying down at the edge, but the lines of growth run over to the hinge line and do the same on the escutcheon also. Valves moderately convex, sculptured with numerous small subequal ribs, inner margins crenulate, hinge as in the figure.

Height, 6 mm.; length, $7\frac{1}{2}$ mm.

Locality: From the "Burrstone," near Beulah P. O., Newton County, Miss.

Remarks.—This little species is strikingly similar to the species named *ASTARTE OPULENTORA* Dall, but that is from the Pliocene of Mexico.

NOTES ON THE CLASSIFICATION OF THE TORNATELLINIDÆ.

BY HENRY A. PILSBRY.

The *Tornatellinidæ* are a group of small or minute land snails found on the islands in and around the Pacific. An illustrated monograph has been prepared for the "Manual of Conchology," but as its publication will be delayed until the appearance of the *Achatinellidæ*, a brief sketch of the classification is here published in advance.

These shells have some resemblance to *Achatinellidæ* and *Partulidæ* in shape, but differ from both families by having an entering parietal lamella. In at least two species this is absent through degeneration in the adult stage, and in some others it is much reduced. Some species of the section *Lamellina* undergo remarkable changes from youth to maturity, the adult stage being secondarily simplified. Young individuals should always be collected with adults, when possible.

Key to Genera and Minor Divisions.

- I. Shell rather *solid*, glossy, bright or dark colored or variegated; axis imperforate, but usually superficially rimate in the adult stage. Genus *AURICULELLA* Pfr.
- II. Shell thin, light brown or corneous, not polished.
 - a. Axis imperforate, slender, the columella more or less sinuous.
 - b. Shell globose-ovate; columella armed with an angular or bilobed vertical callus or plate, truncate or excavated below the prominence. Genus *ELASMIAS* n. gen.
 - c. Spire of few (3 to $4\frac{1}{2}$) whorls; columellar callus in form of a vertical, angular or bilobed plate. Section *Elasmius*.

cc. Spire of 6 to 7 close whorls; columellar callus bilamellate, lamellæ long; palatal plicæ developed. Section *Lamellovum* n. sect.

bb. Shell oblong-conic or turrite, very thin; columella sigmoid or nearly straight, sometimes calloused or bearing lamellæ, not truncate or excavated at base.

Genus *TORNATELLINA* Pfr.

c. Shell oblong-conic; whorls 5 to 7.

d. Aperture having a columellar and a parietal lamella and two palatal folds.

Section *Tornatellina*.

dd. Aperture having columellar and a parietal lamella and more or less serrate, vertical, palatal ribs, at least in the neanic stage.

Section *Lamellina* Pse.

ddd. No palatal armature at any stage; columella more or less sinuous, sometimes lamellate, whorls 5 to 6.

Section *Lamellidea*, n. sect.

cc. Shell long-turrite, whorls 9 to 10.

Section *Elasmatina* Petit.

aa. Axis umbilicate or perforate throughout; columella not sinuous or truncate. Genus *TORNATELLIDES* n. gen.

b. Columella unarmed at all stages of growth.

Section *Tornatellides*.

bb. Columella bilamellate, at least in the young.

Section *Tornatellaria*, n. sect.

Types of the Genera and Minor Groups.

Frickella Pfr. 1855, type *Achatinella amoena* Pfr.

Auriculella Pfr. 1855, type *A. auricula* (Fér.).

Elasmias Pils. 1910, type *Tornatellina aperta* Pease.

Lamellovum Pils. 1910, type *Tornatellina globosa* (Petit).

Tornatellina Pfr. 1842, type *Tornatellina clausa*=*bilamellata* (Anton).

Lamellina Pease 1860, type *Lamellina serrata* Pease.

Lamellidea Pils. 1910, type *Tornatellina peponum* (Gld.).

Elasmatina Petit 1843, type *E. subulata* Pet. = *T. turrita* (Anton).

*Tornatellides*¹ Pils. 1910, type *T. simplex* Pse.

Tornatellaria Pils. 1910, type *T. newcombi* Pfr.

Auriculella and *Tornatellaria* are restricted to the Hawaiian Islands.

Lamellorum and *Elasmatina* to Rapa. The other groups have a wider range. *Lamellidea* and *Tornatellides* range from the Bonin, Luchu and Hawaiian Islands to New Zealand; *Elasmias* from the Japanese Oceanic Islands to Australia, while *Lamellina* does not go south farther than Micronesia and Polynesia. There are some New Caledonian species of *Tornatellina*, but the absence of records of *Tornatellinidae* from the Solomons, New Hebrides and other Melanesian islands is remarkable, and must be due to these minute shells being overlooked. The family is represented by a solitary species in the Galápagos.

A CONCHOLOGICAL MUSEUM FOR JAPAN.

BY Y. HIRASE.

As I stated in the late issue of my paper I am going to establish a conchological museum in the near future and I hope I shall be able to contribute a little to this branch of study. Hon. S. Omori, Governor of Kyoto-Prefecture, Dr. H. Kinoshita, Ex-President of the Kyoto Imperial University, Dr. Y. Tanaka, a member of the House of Peers and two or three others of eminence promised to render assistance, if need be, and are in deep sympathy with my undertaking. I am well convinced that I shall be able to carry out my plan and attain my object, the establishment of a conchological museum.

For the building expenses of the museum, I rely for \$5,000 upon the generosity of persons interested in science in foreign countries. It is not intended to ask contributions, but to issue sets of Japanese shells, the proceeds to be applied to the museum.

Each lot or set contains 500 species of Japanese shells, valued at \$100. Many sets are prepared and can be sent as soon as I receive orders. As to the 500 species in each set, they shall be subject to selection. Let me hear the names of the species desired.

As already said, I do not wish for cash contributions to the museum.

¹The term *Tornatellides* differs sufficiently in spelling and etymology from *Tornatelloides* Pfr.

Yet such donations as specimens of shells, shell fancy-work, books, papers and pamphlets which have descriptions or pictures of shells, etc., will heartily be welcomed. They shall be arranged in cases in the museum, carefully preserved and duly credited to the donors.

Kyoto, Japan.

A NEW VARIETY OF LYMNÆA STAGNALIS.

BY FRANK C. BAKER.

(Concluded from page 113).

Remarks: *Lymnæa stagnalis lillianæ* may be known by its short spire, long and narrow aperture, and compressed body-whorl. It was at first thought to be a form of *sanctaemariae*, but a comparison with that species shows it to be uniformly narrower with compressed body-whorl, and more acute spire. In *sanctaemariae* the body-whorl is always very rotund; the aperture is also roundly ovate, while in *lillianæ* it is elongate-ovate. The musculature of the male organ is also quite different from *sanctaemariae*, and similar to that of *appressa*. *Lillianæ* differs from *appressa* in its short spire, flattened and compressed body-whorl and elongated aperture. It appears to be a distinguishable race of *L. stagnalis*.

No true *appressa* were found associated with this race in Tomahawk Lake. There were a few specimens with spires and aperture of equal length, showing clearly that the race is a modification of the *appressa* type, caused, doubtless, by a change of environment.

At Isle Royale, in Lake Superior, a form of *stagnalis* occurs which at first sight appears quite distinct. A number of individuals, however, approach very closely to var. *lillianæ* and they may be referred provisionally to this race. Judging from the material at hand, this is a transition form between *appressa* and *lillianæ*, representing, perhaps, one of the stages in the evolution of the race. The Isle Royale form "is characteristic of the quieter waters of the long, narrow harbors which are such a remarkable feature of the Island." (Walker). Typical *lillianæ* lives on a wave-beaten shore, and this precarious environment has caused the aperture to become enlarged to provide for the larger foot to enable it to retain its hold on submerged objects. The Isle Royale form, living in quieter water, has not developed the large aperture of the Tomahawk Lake shell.

The Tomahawk Lake shells vary to some extent, those inhabiting the quieter bays having a longer spire and a smaller aperture. These shells closely resemble the Isle Royale specimens and also clearly indicate relationship with *appressa*. Specimens referable to *appressa* were collected at one station in Tomahawk Lake, the habitat being marshy in character. Some pathologic forms occur in the Wisconsin shells, the abnormalities being confined principally to the last whorl and aperture. Specimens from Lake Harriet, Minnesota, collected by Mr. L. E. Daniels, are also referable to this race.

In the course of time this race will probably assume specific characteristics. Its remarkable uniformity points to this.

The race is dedicated to my wife, who assisted in the discovery of the type specimens.

JOHN FORD.

John Ford was born in Chester, Pa., November 15, 1827, and died in Philadelphia, January 10, 1910. He was the son of Lewis H. and Esther (Ogden) Ford. His father died when he was about ten, and he was then practically compelled to shift for himself. He lived for about three years with a farmer in Delaware county, Pa., and then returned to Chester and entered a store. By untiring efforts the boy acquired a substantial education. His great love of nature and of music was a powerful incentive to self-cultivation.

On September 6th, 1847, Mr. Ford married Phoebe T. Flavill, of Chester, Pa. After living for a time in Paterson, N. J., and Shipman, Ill., he returned to Philadelphia in 1861, shortly after entering the Corn Exchange National Bank, where he was continuously employed until July, 1903, when, owing to a severe illness, he was compelled to retire from active business.

Mr. Ford was afflicted for many years by an ever-increasing deafness, which caused him to avoid social gatherings, and in his later years even scientific and musical meetings. Yet his warm and generous nature found pleasure in the company of a few intimate friends who shared his tastes.

Mr. Ford was an accomplished musician, many of his compositions having much merit. He especially excelled in melody. Many of his songs written over thirty years ago are still in favor. His first pub-

lished song, "Will You Love Me when I'm Old?" had a tremendous and immediate success, and was by far the most popular of his compositions, though a number of those appearing later were deemed more worthy of consideration by his musical friends. Among these were "Watching and Waiting," "Daisy and I," "Away Down South," "Sweet Rosalie," and, best of all, "My Ships are Coming Back to Me"—a piece of deep poetic feeling.

As a young man, Ford was deeply interested in geology and mineralogy. A warm friend of Conrad, together they collected cretaceous fossils from the marl beds of New Jersey. With the late Theodore D. Rand he collected the minerals of Delaware and Chester counties. In the early sixties Ford met the Rev. Dr. E. R. Beadle. This acquaintance ripened into a warm friendship, and turned his attention from mineralogy to conchology. He often said—"It was Dr. Beadle who started me in the study of conchology, and who took all my minerals in exchange for shells." George W. Tryon, Jr., was also his warm friend, and their bond of friendship was strengthened by their love of music. Another true and life-long friend who survives him is Mr. Charles Morris, of Philadelphia.

Mr. Ford was elected a member of the Academy of Natural Sciences in 1866 and from that time until his illness in 1903, took an active interest in the Academy's magnificent collection of mollusks. He was especially interested in the local species and those of the New Jersey coast, making a special exhibition collection of both, for the Academy and also for the Wagner Free Institute of Science. Aside from the local shells he was also especially interested in the *Olividae*. His long suites selected to show specific variation are unequalled in this country.

He also brought together a very fine collection of *Cypræidæ*, which although containing none of the great rarities, is notable for its large series illustrative of variation. His entire collection is remarkable for the perfection of the specimens and the great number of representative genera and species of all the principal faunal regions. He had little interest in fresh-water shells, aside from local species, or for the small or minute land snails, though he possessed a very fine series of exotic *Helices* and *Bulimi*, numbering many forms now very rare. The marine pelecypods such as *Veneridæ*, *Cardiidæ*, *Pectens*, etc., of his collection are especially fine.

Mr. Ford published 29 articles on conchological subjects, besides

a number of short notes, and a few articles dealing with paleontological and archaeological topics. His influence was largely personal. At the time of his greatest activity in conchology—1870 to 1895—he maintained a large correspondence, and was always ready to assist students with information from the rich library of the Academy. He was particularly helpful in naming specimens for conchologists who had no access to large collections or libraries, much of his leisure being given to this generous propaganda. Several species were named in his honor, among them *Donax fordii* Conrad, *Cerion fordii* P. & V., *Drymæus fordii* Pils. *Pleurodonte fordiana* Pils., *Phasianella fordiana* Pils., and others.

The portrait accompanying this sketch, is from his last photograph, taken when Mr. Ford was about sixty years of age.

He is survived by two sons William Henry and Albert W. Ford and two daughters Parthenia Ford and Mrs. Charles W. Johnson.

List of the Conchological Writings of John Ford.

1. Remarks on the Argonauta. Amer. Journ. of Conch., IV, 276, 1868.
2. Embryology of Fulgur, etc. Proc. Acad. Nat. Sci. Phila., 1884, p. 292.
3. A Day among the Mollusks. Conch. Exch., I, 21, 1886.
4. Helices in Fairmount Park, Philadelphia. Conch. Exch., II, 7, 1887.
5. Succinea obliqua Say in Fairmount Park, Philadelphia, with some Remarks regarding the Relationship of Succinea totteniana Lea. Conch. Exch., II, 23, 1887.
6. The Fresh-Water Mollusks of Fairmount Park. Conch. Exch., II, 39, 1887.
7. Some Remarks on the Migration of Mollusks. Conch. Exch., II, 71, 1887.
8. Description of a New Ocinebra. Proc. Acad. Nat. Sci. Phila., 1888, p. 188, fig.
9. Description of Helix (Trachia) dentoni. Nautilus, III, 17, 1889.
10. List of Shells of the New Jersey Coast South of Brigantine Island. Naut., III, 27, 1889.
11. Scalaria angulata in New Jersey. Naut., III, 52, 1889.
12. Remarks on Oliva inflata, O. irisans, and Other Species of Shells. Proc. Acad. Nat. Sci. Phila., 1889, p. 137.

13. Notes on *Crepidula*. Proc. Acad. Nat. Sci. Phila., 1889, p. 346.
14. On *Crepidula glauca*. Naut., III, 90, 1889.
15. A Few Last Words on *Crepidula*. Naut., III, 128, 1890.
16. A Glance at the Academy of Natural Sciences of Philadelphia. Naut., IV, 75, 1890.
17. Description of a New *Anctus*. Naut., IV, 81, 1890.
18. Some American Cannibals. Naut., IV, 85, 1890.
19. Description of a New Species of *Helix* [*H. deaniana*]. Proc. Acad. Nat. Sci. Phila., 1890, p. 188.
20. Description of New Species of *Anctus* and *Oliva*. Proc. Acad. Nat. Sci. Phila., 1891, p. 97, figs. 1, 3 and 4.
21. Some Remarks on New Jersey Coast Shells. Naut., VI, 25, 1892.
22. Description of a New Form of *Cypraea*. Naut., VI, 112, pl. 2, figs. 4, 5, 1893; VII, 39, 1893.
23. Remarks on a New Species of *Cypraea*. Proc. Acad. Nat. Sci. Phila., 1893, p. 310, fig.
24. Some Remarks Relative to *Cypraea gregori*. Naut., VII, 78, 1893.
25. A New Variety of *Olivella*. Naut., VIII, 103, pl. 2, fig. 14, 1895.
26. Notes on the Reported Extinction of the Genus *Achatinella*, and Marvelous Development of a Florida *Fasciolaria*. Naut., VIII, 123, 1895.
27. Some References to the Genus *Oliva*. Naut., X, 3, 1896.
28. *Cypraea lynx* deformed by Disease. Proc. Acad. Nat. Sci. Phila., 1897, p. 328, figs. 1-3.
29. Description of a New Species of *Olivella*. Naut., XII, 66, 1898.

H. A. P.

PUBLICATIONS RECEIVED.

Some New South American Land Shells (Smiths. Misc. Coll., vol. 52, p. 361-364, 1909). By Wm. H. Dall. *Pleurodonte tenaculum* and *Helicina heighwayana* are described from the Atrato River, Sierra Darien. The former seems closely related to *P. uncigera* Petit, having a remarkable hook within the basal lip, like that species. The altitude of the shell assigned (6.0 mm.) must be a typographical error. *Odontostomus branneri* is a new form from the province of Bahia, Brazil.

REPORT ON A COLLECTION OF SHELLS FROM PERU, WITH A SUMMARY OF THE LITTORAL MARINE MOLLUSCA OF THE PERUVIAN ZOOLOGICAL PROVINCE. By WILLIAM HEALEY DALL: Proc. U. S. N. M. 37, p. 147-294, Pls. 20-28, 1909.—Dealt with in his usual masterly way, this paper of Dr. Dall is one of the most notable contributions to the fauna of Western South America which has appeared for some years. Ostensibly but a report on the relatively small collection of shells collected by Dr. R. E. Coker, the scope of the paper has been widened, first by the addition of a valuable bibliography, and in later pages by the inclusion of a "List of Species Composing the Fauna," prefaced by several pages of the acute generalizations which we have now come to expect in nearly all the larger works of this author. The list of synonyms at the back is also a most useful feature.

As seems inevitable in a work of this scope a few minor errors and inconsistencies have crept in, some of which it may be well to call to notice, as well as some of the more important changes in nomenclature which Dr. Dall has found it necessary to undertake.

The inaccuracies are as usual connected chiefly with the list of Cephalopods, which has apparently been compiled from the literature without any attempt at revision or the elimination of synonyms.

By the rules of nomenclature the family name *Philonexidæ* (used on p. 193) can have no standing and the creatures grouped under it must either be referred to the *Argonautidæ*, as most authors now maintain; or if segregated the name *Tremoctopodidæ* should probably be used. At any rate the only species here given under this group, *Tremoctopus minimus* Orb., is a synonym of *Argonauta hians* Sol.

On p. 194, *Bolitaena "microtyla"* is a misprint for *B. "microcotyla,"* and *Polypus "fontineanus"* for *P. "fontanianus."* On p. 195 *Ommastrephus gigas* d'Orb. is now held the type of a distinct genus *Dosidicus* Steenstrup, 1857. Also *Steenstrupiola chilensis* Pfeffer is regarded by even its author as but the young stage of *Telcoteuthis platyptera* (d'Orb.) which is also listed on the following page. *Onychoteuthis brachyptera* Pfeffer may also be a synonym of this. *Taonius schneehageni* Pfeffer (listed on p. 196) is a synonym of *Zygocranchia zygaena* (Verany) Hoyle, according to Pfeffer, but further specimens may indicate differently.

It is a pity that original figures of *Polypus fontanianus* and *Loligo*

gahi were not given instead of copies of the unsatisfactory drawings of d'Orbigny. (Plates 20-21).

The new species described are *Modiolus arciformis*, *Aligena cokeri*, *Diplodonta (Felaniella) artemidis*, *Xylotrya dryas* (an interesting form found burrowing in the living mangroves), *Bulimulus cokerianus*, and *Megatebennus cokeri*. *Acmaea orbignyi* Dall is a new name for *A. scutum* Orb. 1841 (not Esch (1833), and the commonly used terms *Anomia lampe* Gray, *Concholepas peruvianus* Lam., and *Crepidula unguiformis* Lam. must give way to *A. peruviana* Orb., *C. concholepas* Brug. and *C. crepidula* Linn. respectively.

The nomenclature of the faunal list presents the usual divergencies from that in common use which are already familiar to those who have read Dr. Dall's "Albatross" Report¹ or his notable memoir on the Oregon Miocene,² but there are still one or two points which seem difficult to understand, namely the retention of the family "Aplysiidæ" after the rejection of *Aplysia* for *Tethys*: the adoption of the family name *Turritidæ*³ but not *Epitoniidæ*; of *Bullariidæ* and *Alectrionidæ* but not *Architectonicidæ*.

Murex elenensis Dall is a new name for *M. plicatus* Sowerby 1840 (non Gmelin 1791), *Thais peruensis* Dall replaces *Purpura peruviana* Eydoux and Souleyet 1852 (not Blainville, 1832), *Architectonica* (= *Solarium*) *nanum* (Koch) Philippi, 1853 (not Grateloup, 1838) becomes *A. kochii* Dall, *Fissurella aspera* Sowerby 1834 (not Eschscholtz, 1833) becomes *Fissuridea asperior* Dall, and *Chiton bipunctatus* Sowerby 1832 (not Fisher, 1808) is changed to *Tonicella (Mopaliella) stigmata* Dall. Among the *Pelecypoda*, *Pectunculus minor* Orbigny 1846 (not Lea 1833) becomes *Glycymeris chemnitzii* Dall, and *Donax aricana* Dall replaces *D. radiatus* Valenciennes, 1833 (not Gmelin 1791).

Another interesting point which may be observed in this connection with some propriety is that most writers on the mollusca of our Southeastern and Gulf States seem to have overlooked the fact that the *Siphonaria lineolata* of Orbigny, 1853 is preoccupied by Sowerby 1835. That name should therefore be restricted to the Chilean

¹ Bull. Mus. Comp. Zool. xliii, No. 6, Oct., 1908.

² U. S. Geol. Surv. Prof. Pap., No. 59, 1909.

³ The correct spelling is *Turritidæ* as H. & A. Adams have shown. (Gen. Rec. Moll. II, p. 614, 1858).

species, while the Floridian form will then be known as *S. naufragum* Stearns. The chief synonymy of the two species is as follows :

SIPHONARIA LINEOLATA Sowerby.

1835 *Siphonaria lineolata* Sowerby, Proc. Zool. Soc., p. 6.

1856 *Siphonaria lineolata* Reeve, Conch. Icon., v. 9, Siphonaria, Pl. 3, fig. 11.

1909 *Siphonaria lineolata* Dall, Proc. U. S. N. M., v. 37, p. 205.

SIPHONARIA NAUFRAGUM Stearns.

1853 *Siphonaria lineolata* Orbigny (*non* Sowerby), Moll. Cuba, I, p. 232, Pl. XVII, fig. 13-15.

1872 *Siphonaria naufragum* Stearns, Proc. Bost. Soc. Nat. Hist., XV, p. 23.

1902 *Siphonaria lineolata* Dall; Proc. U. S. N. M. XXIV, p. 501, Pl. xxvii, fig. 10 and 13.

S. S. BERRY, Harvard University, Massachusetts.

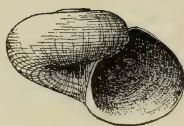
THE OPISTHOBRANCHIATE MOLLUSCA OF THE BRANNER-AGASSIZ EXPEDITION TO BRAZIL, by Frank Mace MacFarland (Leland Stanford Junior University Publications No. 2, 1999).—The following species are described : *Tethys dactylomela* (Rang), *T. cervina* Dall and Simpson, *Pleurobranchus agassizi*, *Discodoris branneri*, *D. voniheringi*, *Peltodoris greeleyi* and *Spurilla braziliiana* nov. spp. The internal anatomy of all the species is fully described and illustrated with excellent figures. Professor MacFarland's excellent work on Opisthobranchs is making amends for the neglect of the group by American zoologists.—H. A. P.

NOTES.

ALBINO OLIVA ANGULATA.—We have recently received for examination a large and perfect specimen of *Oliva angulata* which is snow-white except for a small fleshy-brown stain on the callus at the posterior angle of the aperture and a rusty yellow stain in front of the callus. This albino, which may be called form *nivea*, is the first to be reported of this species, so far as we know. It seems to be an extremely infrequent variation. The specimen measures 83 mm. long, 42.5 wide. It is the property of the A. L. Hettrich Company, of San Francisco.—H. A. Pilsbry.



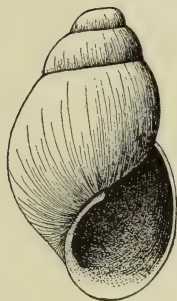
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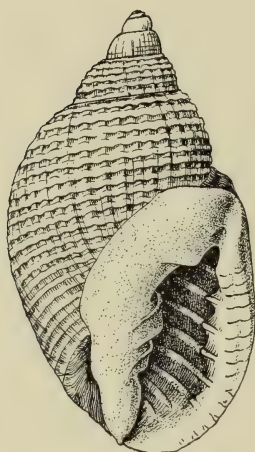
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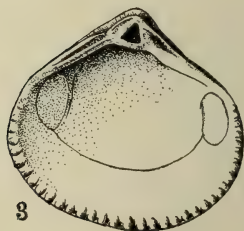
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BARTSCH: NORTHWESTERN MARINE SHELLS.
ALDRICH: NEW EOCENE FOSSILS.

THE NAUTILUS.

VOL. XXIII.

APRIL, 1910.

No. 11

NEW SPECIES OF WEST AMERICAN SHELLS.

BY WILLIAM HEALEY DALL.

Several new shells have turned up lately in material received from the Pacific Coast, of which descriptions follow.

OLIVELLA (ANAZORA Ducl. var. ?) PORTERI Dall.

Shell of about the form and size of the east American *O. jaspidea*, with very variable coloration; whorls about seven, spire acute with a very deep and narrow channeled suture not obscured by callus; surface of the whorls brilliantly polished, smooth, except for microscopic spiral close striation which is present on all, but more uniform on particular individuals; color pale olive, yellow, or whitish, with sharp angular axial brown lines superposed between the suture and the basal fasciole, sometimes forming a tent-like pattern and sometimes reduced to fine, close, more or less cloudy zigzags; a pale band in front of the suture, usually with vivid brown zigzag pointed forward, but sometimes plain, the brown lines when present broader and stronger than elsewhere; basal fasciole short, with a marginal and an adjacent narrow fold or plait anteriorly, lighter than the body, yellow or rich bluish purple; aperture narrow, simple, with a deep sutural sinus and a moderate parietal callus when mature. Height of shell 15; of aperture 9; max. diam. 6 mm.

From sandbars near the entrance to San Diego Harbor, and at Scammon Lagoon, Lower California, Miss J. M. Cooke. U. S. Nat. Mus. 209677. Named in honor of Captain George Porter who collected largely in the Gulf of California, and is supposed to have lost his life at Tiburon Island while on a collecting expedition.

The Scammon Lagoon specimens are more grayish than those from San Diego.

The nearest ally to this species is the shell figured by Marrat in the Thesaurus, plate 350, figure 419, under the name of *anazora* Duclos. This, judging by the figure, is a much smaller and somewhat stouter shell, with less distinct markings. The shell represented by figure 411 on the same plate is that identified by Dr. Carpenter and H. Cuming for the Smithsonian collection as *O. anazora* Duclos, though it is named *O. pulla* by Marrat. The heavy white callus on the body extending beyond the suture amply distinguishes it from *O. porteri*. I have not access to Duclos' original paper and hence cannot resolve the doubt as to which is Duclos' *anazora*.

The previously known Californian Olivellae were none of them of remarkable beauty, though some of the Gulf species are very attractive, but the present form is one of the prettiest shells of the coast. It may be that its range extends further north.

POMAULEX TURBANICUS n. sp.

Shell moderately large, rather thin, brilliantly pearly inside, covered with a reddish brown periostracum which becomes olivaceous on the base; form rather depressed, with turgid whorls, about six in all, the nucleus white, blunt, imperfect; base flattened, bordered by a sparsely nodulous carina; sculpture on the spire of slightly protractive, rounded, short, rather elevated riblets reaching about half way forward on the whorl from the suture (17 on the last whorl), ending in or barely separated from the same number of stout nodules at the periphery, with a marked sulcus separating them from a similar row of nodules on the margin of the base; base with four somewhat undulated spiral ridges separated by subequal interspaces, except the inner pair which are smaller and closer to each other; base imperforate, swollen at the base of the pillar; aperture ample; surface of the body erased, leaving visible pearly and white substance; the pillar arcuate, pearly; with no anterior prominence or tooth; outer lip and base simple, sharp; operculum white, rounded, shelly, with three partly gyrate, very prominent, granose, narrow ribs, the spaces between them excavated and smooth. Height of shell 37.5; of last whorl 30.0; of aperture (vertical) 21.5; max. diameter 41.0 mm.

U. S. Fish Commission station 2989, in 36 fathoms, coral, off Magdalena Bay, Lower California. U. S. Nat. Mus. 111242.

This is remarkably distinct from any of the previously known West American species.

PACHYPOMA MAGDALENA n. sp.

Shell conic, the sides of the spire flattened, the base flattened and somewhat concave, the basal margin compressed with a rounded and undulate edge; whorls about seven; the nucleus white, worn, sides covered by a scarlet periostracum which becomes darker on the base; sculpture of about thirty-four subequal protractive low riblets which are cut into elongate nodules by four spiral sulci, the peripheral nodules being longer and most prominent, giving the effect of a pre-sutural band; on the base are four subequal and subequally spaced spiral riblets, which in the young are sometimes nodulous or undulate; pillar pearly, space about it white or pearly, as is the interior of the aperture; the suture laid on the peripheral carina is undulate and in the young the base has a stellate appearance; the periostracum is strongly striate in the direction of growth. Height of shell 38; of last whorl 32; of aperture (vertical) 5; max. diameter 38 mm.

Station 2989, U. S. Fish Commission, with the preceding, U. S. Nat. Mus. 111239.

This is of the same general type as *P. inæquale* Martyn, but more delicate, smaller and more elegantly sculptured. The operculum is essentially like that of *P. inæquale*, which is not authentically reported south of the Santa Barbara Islands.

With these shells were taken two young specimens of *Uvanilla regina* Stearns, (unfortunately not containing the soft parts) thus adding another station to the known range of this excessively rare and beautiful species.

PACHYPOMA LITHOPHORUM n. sp.

Shell small, turbinate-conic, with about six moderately convex whorls, the basal margin being either bluntly rounded or undulately carinate; suture appressed, whorls covered with a reddish periostracum striated in harmony with the incremental lines; sculpture between the suture and periphery of nine closely and prominently beaded, alternately stronger and weaker spiral cords, with only linear interspaces; periphery in the type specimen with three finer threads; the base flattish, with six subequal, more or less undulate or beaded

cords with narrower interspaces; umbilical area imperforate, smooth, slightly excavated, white; pillar arcuate; smooth; aperture very oblique simple, pearly white within; operculum? Height of shell 32.5; of last whorl 20.5; of aperture (vertical) 11.5; max. diameter 36.5 mm.

U. S. Fish Commission station 2983, off Cerros Island, Lower California, in 58 fathoms, sand. U. S. Nat. Mus. 111241.

Of three dead specimens dredged, one had the periphery compressed and roundly keeled, and on the spire were some feeble indications of axial ribbing.

NEW MARINE SHELLS FROM THE NORTHWEST COAST OF AMERICA.

BY PAUL BARTSCH,¹

Assistant Curator, U. S. National Museum.

In a collection of mollusks submitted to the U. S. National Museum for critical examination, by Dr. Fred. Baker of San Diego, California, collected by him on the Northwest Coast, are several new forms which are here described.

The types of these species have been kindly donated to the National Museum by Dr. Baker.

LEPTOGYRA ALASKANA new species. Pl. XI, figs. 4, 5, 6.

Shell minute, depressed helicoid. Nuclear whorls one and one-half, light yellow horn color, marked by faint incremental lines. A single post-nuclear turn follows which is bluish white, rather broad and gently, almost evenly curved from the well-impressed suture to the periphery. This whorl is marked by about twelve, fine, incised spiral lines between the suture and the periphery which are stronger toward the periphery than at the suture. Periphery of the last whorl rounded. Base broadly and deeply umbilicated, strongly arched, with a slender cord at the junction of the basal and parietal wall, surface of the base marked by incised lines which are equal in strength and number to those occurring upon the upper surface. Wall of the umbilicus almost flat, marked by faint spiral lines.

¹ Published by permission of the Secretary of the Smithsonian Institution.

Aperture very large, subcircular, posterior angle obtuse; outer lip thin; columella curved, somewhat expanded and thickened basally; parietal wall covered with a thin callus. Operculum thin, horny.

Twelve specimens of this species were collected by Dr. Fred. Baker at Port Graham, Alaska, four of which are in the U. S. National Museum, cat. no. 208433. One of these, the type, measures; greater diameter 0.85 mm., lesser diameter 0.7 mm., altitude 0.4 mm. The remaining eight specimens are in Dr. Baker's collection.

ALVANIA BAKERI, new species. Pl. XI, fig. 8.

Shell minute, bluish white. Nuclear whorls one and one-third, forming a moderately elevated spire. Upper half of the well-rounded nuclear whorls marked by about ten very fine closely spaced spiral striations, lower half marked by numerous closely spaced depressed elongate granules, each of which has the long axis decidedly protractively slanted; which lends to this part of the turn a finely blistered appearance. Post-nuclear whorls a little more than two, well rounded, separated by a strongly constricted suture marked by three strong rounded spiral keels of which the strongest is a little anterior to the posterior third between the sutures, while the anterior of the other two, which are of equal strength, is at the periphery and the third halfway between them. In addition to these keels the whorls are marked by fine incised spiral lines between the keels which are best developed on the well-rounded shoulder between the summit of the whorls and the strong keel below it. Base of the last whorl slightly protracted, well rounded, marked by two broad depressed spiral cords of which the basal one which is a little anterior to the middle is the broader. In addition to these are numerous exceedingly fine spiral striations. The axial sculpture of the entire spire and base consists of very fine incremental lines only. Aperture very broadly ovate, almost circular, peritreme continuous, outer lip thick within, beveled at the margin to form a sharp edge which is rendered slightly sinuous by the external spiral sculpture; columella strong and strongly curved, parietal wall of the aperture appressed to the preceding whorl.

The type, cat. no. 208445 U. S. N. M., was collected by Dr. Fred Baker at Port Graham, Alaska. It measures; length 1.4 mm., diameter 1.2 mm.

ONOPA ASSER, new species. Pl. XI, fig. 9.

Shell elongate conic, bluish white, semitranslucent. Nuclear whorls one and one-tenth, smooth, a little less elevated than the succeeding turns. Post-nuclear whorls very high between the sutures, overhanging, moderately rounded, appressed at the summit. The preceding whorl shines through the summit of the succeeding turn and gives this the appearance of having a double suture. Sutures well impressed. Periphery of the last whorl well rounded. Base moderately prolonged, well rounded. Entire surface of spire and base marked by closely placed exceedingly fine microscopic spiral striations. Aperture very broadly ovate, posterior angle obtuse, outer lip thin; peritreme complete.

The type, cat. no. 208434 U. S. N. M., was collected by Dr. Fred Baker at Fort Graham, Alaska. It has four and a half whorls and measures: length 2.2 mm., diameter .9 mm. This species is nearest related to *Onoba cerinella* Dall, from which it is distinguished by its lesser size and more delicate structure.

ODOSTOMIA (EVALEA) COOKEANA, new species. Pl. XI, fig. 7.

Shell elongate ovate, very narrowly umbilicated, yellowish white. Nuclear whorls very obliquely immersed in the first of the succeeding turns. Post-nuclear whorls very high between the sutures where they are very moderately rounded and marked by rather strong incremental lines and very numerous fine spiral striations. Periphery and base of the last whorl somewhat inflated, the latter strongly rounded and marked like the spire. Aperture large, oval; posterior angle acute; outer lip thin; columella decidedly oblique, quite strongly curved in the middle and somewhat reflected, provided with an oblique fold at its insertion which is strong within and tapers to a vanishing point at the free edge of the columella; parietal wall glazed with a thin callus.

Two specimens of this species were collected by Dr. Baker at Ellamar, Alaska. One of these, an immature specimen, furnished our description of the nucleus, the other, cat. no. 208427 U. S. N. M., gave the adult characters. The adult specimen has its nucleus badly eroded. The four remaining whorls measure: length 3.2 mm., diameter 2.0 mm. The young individual which is in Dr. Baker's collection has $2\frac{1}{2}$ whorls and measures: length 2.3 mm., diameter 1.4 mm.

Named for Miss J. M. Cooke of San Diego at the request of Dr. Baker.

THE SYSTEMATIC POSITION OF THE UNIONID-GENUS PARREYSIA.

BY A. E. ORTMANN.

IN NAUTILUS, vol. 22, Feb. '09 p. 107, Frierson reports that in *Parreysia* all four gills serve as *marsupium* in the gravid female, a character which does not agree with Simpson's definition of the sub-family *Hyriinæ* (*Hyriianæ*). He concludes that, in this instance, we should not pay attention to the marsupial character, but should rely upon the radial sculpture of the beaks of the shell.

Recently I received a number of these *Parreysias* through the courtesy of Mr. Frierson, and I am much obliged to him for giving me the opportunity to examine them. I should call the species *Parreysia wynegungaensis* (Lea) although a number among them distinctly incline toward *P. corrugata* (Muell.) There are 30 of them, 13 males, 11 sterile, and 6 gravid females; none of the latter had glochidia, but only eggs in various stages of development. There was no sex differentiation whatever in the shells.

An examination of the soft parts revealed the fact, that not only all four gills are marsupial in the female, but that *the whole structure of the soft parts is absolutely like the North American Quadrula* (see: Ortmann, in: NAUTILUS, 23, Feb. '10 p. 116). The only, and unimportant, differences are, that the *supraanal opening* is rather widely separated from the anal, and that the *inner lamina of the inner gill* is entirely connected with the abdominal sac. For the rest, all other characters are like *Quadrula*, and the most prominent features are the following.

The inner edge of the anal opening is finely crenulated; that of the branchial opening is papillose, and rather well defined anteriorly; in front of the latter, there are fine crenulations on the inner mantle-edge for a short distance, but no special structures, such as papillæ or flaps. The gills are unequal, the outer considerably smaller than the inner. The diaphragm is normal, and the outer lamella of the outer gill is connected with the mantle to the posterior end. In the male, there are *well developed water tubes* in the gills, but they are rather wide, and the septa separating them are far apart. In both, the male and female, the edge of the inner gill possesses a longitudinal furrow, which is absent in the outer gill. In the female, *all four gills serve as marsupium*, and possess the structure of marsupial gills; the water tubes are narrow, and the septa are close together

(in the outer gill closer than in the inner). The septa show, in the sterile female, in both gills the characteristic folded epithelium. When gravid, all four gills swell but *only moderately, and the edges always remain sharp*, and do not possess the faculty of distending. The water tubes (ovisacs) *remain simple*, and in each of them the eggs form a subcylindrical, only slightly compressed, mass, a placenta, which, however, is not very solid, the mutual adhesion of the eggs being rather slight.

With the exception of the two features mentioned above, *Parreysia* is thus identical, in its anatomy, with *Quadrula*. If we add to these two differences the radial sculpture of the beaks, we would have good generic characters. But the genus, at any rate the species *wyngungaensis* which stands close to the type species of the genus, *corrugata*, should be removed from the subfamily *Hyriinæ*, and placed into the subfamily *Unioninæ* (NAUTILUS, 23, '10 p. 116), by the side of, and close to *Quadrula*. The definition of the *Unioninæ* should be slightly modified with regard to the supraanal opening and the inner lamina of the inner gills, so as to include *Parreysia*, but these modifications are irrelevant.

This, of course, means that I do not attribute any significance to the beak sculpture, but I think I am fully justified in this. If we make radial beak sculpture the prime character of the *Hyriinæ*, we would be compelled not only to unite the Afro-Asiatic forms, like *Parreysia*, with the South American *Hyriinæ*, which, I believe, is a great mistake, but we would also have to unite with the *Hyriinæ* a number of *living North American* shells. For we must not forget (and this is a fact generally overlooked) *that we have radial (zig-zag) beak sculpture in a number of species of Quadrula*. I name the following: *Quadrula (Rotundaria) tuberculata* (Raf.), *Qu. infucata* (Conr.) and *kleiniana* (Lea), *Qu. lachrymosa* (Lea), *forsheyi* (Lea), *speciosa* (Lea), *apiculata* (Say). Also in *Qu. cylindrica* (Say) traces may be seen. This zig-zag radial sculpture is best developed in the species first named; in the others it goes generally as "double-looped," but, in my opinion, the so-called "double-looped" sculpture is but the last remnant of the zig-zag sculpture.

Furthermore, *radial beak sculpture is a quite frequent feature in North American fossil Unionidæ* from the Mesozoic era. If we look at the beak sculpture of *Unio holmesianus* White (see: 3 Ann. Rep. U. S. Geol. Surv. '83, pl. 16, fig. 2-6) from the Laramie of southern

Wyoming; or at the beak sculpture of a number of species described by Whitfield from the Laramie of Montana (see: Bull. Amer. Mus., N. H. 19, '03 p. 483 and 23, '07 p. 623), we cannot deny, that we have here a beak sculpture corresponding very closely to the "radial" sculpture of certain Asiatic types. This is especially true in: *U. retusoides* Whitf. ('03, pl. 38, fig. 6), *U. browni* Whitf. (*ibid.* pl. 38, fig. 3), *U. percorrugatus* Whitf. (*ibid.* pl. 40, figs. 3, 4), and *U. pyramidatoides* Whitf. ('07, pl. 41, fig. 1), *U. letsoni* Whitf. (*ibid.* pl. 42, figs. 1-3). I have, fortunately, a number of specimens before me, coming from the same general region as Whitfield's material; they were collected for the Carnegie Museum at Hell Creek, Dawson Co., Montana, and show the beak sculpture beautifully in *U. retusoides*, *browni*, *pyramidatoides*, *letsoni*, and in addition it is distinctly seen in specimens of *U. verrucosiformis* Whitf. ('07, pl. 42, fig. 5). Some of these fossil forms undoubtedly are the ancestors of modern species, as is sometimes expressed in their names (but not always correctly; *pyramidatoides* has nothing to do with *Qu. pyramidata*, but belongs clearly to the *trigona*-type). Thus it is evident that many North American *Unionidæ* once had radial beak sculpture, and some have preserved traces of it up to the present time. This character probably once was more generally distributed, and remains rather well preserved in many old world forms (and also in South American groups), but in North America it has become more and more obliterated. Such a character, of course, although fit to indicate genetic relationship, is unfit to be used as a principle for classification.

The structure of the soft parts, which indicates close relationship between *Quadrula* and *Parreysia*, is much more reliable, in fact according to my experience, is absolutely reliable. In this connection it should be mentioned that in one of our gravid *Parreysias* only the outer gills were filled with eggs; but microscopical investigation showed that also the inner gills had the typical structure of the female marsupial gill, and that, in this instance, the specimen was just in the beginning of the period of gravidity, and the inner gills were not yet charged. Similar cases might sometimes lead to mistakes, if investigated only superficially.

Of course, we now stand before the task of redefining the subfamily *Hyriinæ* according to the South American typical representatives, and to investigate additional so-called *Hyriinæ* from Asia and

Africa. I hope to be able to contribute to the solution of the first question in the future, since the Carnegie Museum recently has received a good deal of alcoholic material of South American *Unionidæ*, which is waiting for identification and examination.

NEW SPECIES OF SPHAERIIDAE.

BY V. STERKI.

Sphærium lineatum, n. sp.

Mussel somewhat elongate, inequipartite, well inflated; beaks somewhat anterior, rather large, full, rounded, projecting over the hinge margin; superior and inferior margins moderately and regularly curved, anterior and posterior subtruncate-rounded, oblique; scutum and scutellum distinctly marked, narrow; surface dullish with a slight silky gloss, with the concentric striæ (sulci) fine, sharp, crowded, regular, and several (3 or 4 to 7) strongly marked, dark lines of growth; color grayish-horn to reddish, the latter prevalent on the beaks and upper part of older specimens; shell rather thin, hinge slight, long, plate narrow; cardinal teeth small; slight, short, the right curved or angular, emarginate, its posterior part bifid, the left anterior rudimentary or wanting in some specimens;¹ ligament long, slight covered.

Long. 15.5, alt. 11.5, diam. 8. mill. (Turkey Lake).

Long. 14, alt. 10.5, diam. 8. 5 mill. (Wetherby).

Soft parts not seen.

Hab.: Turkey Lake, Kosciusko Co., Indiana, collected by Mr. L. E. Daniels, of the Indiana Geological Survey, in 1902.

A Sph. from Mountain Lake, Marquette Co., Michigan (Upper Peninsula), collected by Mr. Bryant Walker, in 1898, and sent for examination then, appeared to be of the same species. The mussel is somewhat smaller, with the beaks slightly more anterior, the inferior margin less curved and the infero-posterior angle somewhat more marked. These Sphæria, although well represented by good specimens of various stages of growth, and regarded as distinct, were shelved for years, in the hope of getting additional material. Lately Mr. Bryant Walker kindly sent me a lot of the Wetherby collection, which unfortunately has no label. Although such specimens should

¹As occasionally found also in other species.

be considered worthless, the present ones were so manifestly of this same species that they may be regarded as a confirmation of it. They are rather like the Mountain Lake mussels in shape, but somewhat larger, and somewhat more inflated than the Turkey Lake form. It appears that the comparatively numerous, strong, mostly dark lines of growth and the fine (as compared with those of other species), sharp, crowded striae are characteristic and, combined with surface appearance and color, let specimens be recognized at a glance.

Specimens of the type lot are in the Museum of the Geol. Survey of Indiana and in the Carnegie Museum, Pittsburgh (No. 5465 of my collection of *Sphaeriidae*), in the collection of Mr. Bryant Walker and the Mus. Acad. N. Sc. Phila.

PUBLICATIONS RECEIVED.

KEY TO THE GENERA OF GASTROPODA OF MICHIGAN. By H. BURRINGTON BAKER. (Reprint from the 11th Rept. Mich. Acad. Sci., 1909, pp. 134-140.)

DESCRIPTIONS OF NINE SPECIES OF ENNEA AND FIVE HELICIDS FROM SOUTH AFRICA. By JAMES COSMO MELVILL and JOHN HENRY PONSONBY. (Ann. Mag. Nat. Hist., vol. 4, ser. 8, pp. 485-492, pl. 7, 1909.)

REPORT ON THE MARINE MOLLUSCA OBTAINED BY MR. J. STANLEY GARDNER, F. R. S., AMONG THE ISLANDS OF THE INDIAN OCEAN IN 1905. By JAMES COSMO MELVILL. (Trans. Linn. Soc. London, XIII, pp. 65-138, pl. 5, 1909.) About 170 species are recorded of which 15 are new to science.

MOLLUSCA FROM THE HOPE ISLANDS, NORTH QUEENSLAND. By C. HEDLEY. (Proc. Linn. Soc. N. S. Wales, 1909, vol. 34, pp. 420-466, pls. 36-44.) An interesting paper treating of a rich and varied fauna. The Hope Islands are situated near Cooktown, just inside the Endeavor Reef. The writer states that more than 700 species were secured; 100 species are discussed in this paper, half of which are new to science. The figures are unusually fine in detail and sculpture.

DESCRIPTIONS OF NEW AND NOTES ON OTHER AUSTRALIAN POLYPLACOPHORA. By C. HEDLEY and A. F. BASSET HULL.

(Records Australian Mus., vol. 7, pp. 260-266, pls. 73 and 74, 1909.) Four species are described as new.

A REVISED CENSUS OF THE TERRESTRIAL MOLLUSCA OF TASMANIA. By W. F. PETTERD and C. HEDLEY. (Records Australian Museum, vol. 7, pp. 283-304, pls. 82-87, 1909.) A complete revision of the species, with illustrations of all Tasmanian land shells hitherto unfigured. *Cystopelta bicolor* is described.

THE list of San Bernardino County mollusks in the November number of THE NAUTILUS (Vol. XXIII, pp. 73-79) does not include *Lymnæa bulimoides techella* Hald. I found this species in considerable numbers during the summer of 1909, in Sec. 33, Tp. 2 S., R. 7 W., very near the county line, but the owner assures me that his property is in San Bernardino County. They were in a pond surrounding an artesian well. Dr. Frank C. Baker identified the specimens.—JUNIUS HENDERSON, *Boulder, Colo.*

NOTE ON THE SUMMARY OF THE MOLLUSCA OF THE PERUVIAN PROVINCE.—There are some points in Mr. Berry's review of this paper which show that even those things which are obvious, or seem to be so, should not be omitted. In preparing this list it was not my intention to review the whole molluscan classification or nomenclature, which would have taken as many years as the list I prepared took months. In those groups which are not familiar to me, I fell back on the only modern classified lists of the Cephalopods and Nudibranchs, namely those of Hoyle and Bergh, as indicated in my bibliography; the experience and reputation of these authors being such as to require no apology for accepting their results. In the case of the *Bolitæna* I followed the spelling of the name as given in the work referred to, the Bulletin of the Museum of Comparative Zoology. *Polypus fontaineanus* was named after N. Fontaine, and though it happened to be misprinted *fontanianus* in the first fasciculus of Orbigny's work, and this misprint was copied on the plate by the engraver, the error was corrected in the index of the book somewhat later. Under these circumstances we are authorized by the rules to accept the correction, as Mr. Berry proposes to do in the case of *Turridæ*. However in the latter case since the derivatives of *Turris* in Latin (*turritus*) English (*turrited*) and so far as I know all other languages, accept the euphonic "t" in derivatives of *Turris*, I kept the earlier form which is more in harmony with *Turritellidæ* and similar accepted locutions. The illustrations of the work were intended for those interested in the identification of the economic shellfish and not for anatomists, and for this purpose Orbigny's plates are quite satisfactory. As Whewell remarked "We are none of us infallible, not even the youngest of us."—*Wm. H. Dall.*

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THE NAUTILUS

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OF CONCHOLOGISTS.

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H. A. PILSBRY, Special Curator of the Department of Mollusca,
Academy of Natural Sciences, Philadelphia.

C. W. JOHNSON, Curator of the Boston Society of Natural History.

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MAY, 1910.

No. 1

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ON THE VARIATION OF *APLUSTRUM AMPLUSTRE* LINNE.

BY CATHARINE J. BUSH, PH.D.

Zoological Department, Yale University Museum.

A short series of exceptionally fine specimens of this species has recently been presented to the Yale University Museum by Mr. Bruce Cartwright, Jr., '05. They were collected by him on Hammer Point, Pearl Harbor, Oahu, Hawaii, where they were quite common in the sand under coral and lava rocks.

The largest is eleven-eighths inches long and seven-eighths broad, and the smallest a little over seven-eighths inches long and five-eighths broad. There is considerable variation in the height of the spire; in the largest example each whorl, beyond the minute tilted and partly immersed nuclear one, is a little raised, forming a well elevated spire of about five-sixteenths of an inch in height. In others the early whorls are coiled in the same plane, forming an obtuse apex, and in one the coiling is reversed so that the early whorls are sunken. There is also great variation in the exposure on the last whorl. The pink and white color bands do not noticeably differ in width, but the black lines bordering them do vary, and in one instance an additional black line appears in the middle of the peripheral white band. There is also great variation in the forming of the inner lip of the aperture. In some of the specimens it closely adheres to the body of the shell and has an irregular outline with a free edge, which forms a distinctly lamella-like margin, or outer wall, to a deep open canal extending the entire length of the columella. In others it is seen only as an adherent patch just beneath the suture

and again appears, curving outward, at about the middle of the columella as the lamella-like margin.

One specimen has a conspicuous groove in the middle of the peripheral white band, and although very uniform, it is undoubtedly due to injury.

The species is well figured both by Adams and Pilsbry. It has been recorded from northeast Australia, Sandwich and other islands of the Indian and Pacific oceans. Type loc., Mauritius.

A NEW FLORIDIAN AMNICOLA.

BY WILLIAM H. DALL.¹

Some fresh-water marl from a swamp at the south end of Lake Panasoffkee, six feet below the present surface, collected by Mr. A. M. Harper, was recently submitted for examination by Mr. C. A. Davis, of the U. S. Geological Survey. It contained a number of species known to live in the region, in determining which I had the kind assistance of Dr. H. A. Pilsbry. One species which will probably be found living, later on, seems to be new.

AMNICOLA HARPERI n. sp.

Shell minute, depressed, rapidly enlarging, with about three whorls; surface smooth, except for faint incremental lines, almost polished, the whorls are full and rounded, almost circular in section, thus forming a deep suture; umbilicus wide and deep, the whorl evenly rounding into it; aperture nearly circular, with a faint angulation where it touches the preceding whorl, the margin entire, simple, slightly expanded, the plane of the aperture slightly oblique. Height of shell 1.2, diameter 1.3, diameter of aperture 0.7 mm.

This little shell looks like a very minute replica of *Valvata sin-cera*, and if it were not for the slight angulation of the aperture would have been referred to *Valvata*. No Lymnæas were found in the marl. The species associated with *A. harperi* were: *Pisidium* sp.; *Succinea* sp.; *Physa heterostropha*; *Ancylus tardus*; *Planorbis tri-volvis*, *parvus*, *dilatatus*, and *alabamensis* var. *avus*; *Paludestrina monas* Pils., and *brevissima* Pils.; *Amnicola johnsoni* and *augustina* of Pilsbry; *Vivipara georgiana* Lea and *Goniobasis papillosa* Anth.

¹By permission of the Director of the U. S. Geological Survey.

A NEW SPECIES OF MUSCULIUM.

BY V. STERKI.

MUSCULIUM PUSILLUM n. sp.

Mussel small, subequipartite, moderately inflated, rather rounded in outlines to subtruncate anteriorly and posteriorly; beaks very little anterior and little inclined towards the anterior, somewhat projecting, calyculate, made up wholly of the nepionic valves marked off from the post-embryonal by a deep constriction; concentric surface striæ microscopic, slight, somewhat distant, irregular, most marked and more crowded over the widest part of the beaks; color (of dead shells) whitish to straw, surface somewhat shining; shell very thin and fragile; hinge very slight but well formed, right cardinal tooth moderately curved with its posterior end thicker to even hooked, left anterior slightly curved, posterior very short, oblique. Long. 4, alt. 3.6, diam. 2.4 mill.

Soft parts not seen.

Hab.: Hancock Creek, Dickinson Co., Michigan (Upper Peninsula), collected by an expedition of the Geol. and Nat. Hist. Survey of Michigan, in 1909. Types in the museum of the Univ. of Mich. (No. 193 of the expedition's collecting), and in the Carnegie Museum (5459 of my collection of *Sphæriidæ*).

There were about a dozen specimens, all dead shells, most of them single valves and partly broken. Most of them were nearly of the same size, a few smaller (3.3 and 3.4 mm. long). They may not be full grown, but even as such they are decidedly different from immature specimens of all *Musculia* described. As to color, surface appearance and thinness of the shell, they somewhat resemble *M. ryckholti* Normand, but are less inequipartite, less oblique, less high, less inflated, and evidently smaller.

AGRIOLIMAX AGRESTIS LINN. AT WACO, TEXAS.

BY JOHN K. STRECKER, JR.

In the early portion of February, 1909, the writer, in company with Mr. Ed. Ainsworth, city editor of the Waco *Times-Herald*, vis-

ited a small rocky gully about three miles north of Waco, in quest of some fossil bones which the latter had discovered there some time previously. Our time was limited and conditions unfavorable, so that we made no attempt to explore the wooded hill on the left-hand side of the gully, but in the few hours we were in the locality I saw indications that led me to believe that a careful search would yield a good harvest of shells. A month later I returned, this time with Prof. W. T. Gooch, and together we devoted several hours to the collecting of mollusks. As a result we were enabled to add two species to the McLennan county list, i. e., *Omphalina friabilis* W. G. B. and *Agriolimax agrestis* Linn.

Omphalina was found in small numbers under stones and logs lying along the foot of a rocky bluff, on the level above the gully. Prof. Gooch found the first slug and in the next half-hour we obtained at least a dozen more, the largest about 28 mm. in length. They were found under masses of cowdung lying along a path and were associated with various species of *Coleoptera* and a few examples of *Vitrea indentata umbilicata* Ckll. In regard to examples submitted to Bryant Walker, that gentleman writes as follows: "I think that the slug is a variety of *Agriolimax agrestis*. It has the light-colored space around the respiratory foramen and the dark reticulations characteristic of that species."

Other living mollusks found on the hill were *Helicina orbiculata tropica*, *Praticolella berlandieriana*, *Polygyra roemeri*, *P. texasiana*, *P. mooreana*, *Bulimulus dealbatus liquabilis*, *Pyramidula alternata*, *Bifidaria* sp.

As far as I know, *Agriolimax agrestis* has not previously been recorded from the State.

NOTES ON LAND-SHELLS FROM MATAGORDA PENINSULA, TEXAS.

BY JOHN K. STRECKER, JR.

On the 14th of July, 1908, I accompanied a pleasure party from Palacios, Texas, across the bay to Matagorda Peninsula. This peninsula is the long, slender projection of Matagorda county which separates the bay of the same name from the Gulf. We landed on the bay side, and while the balance of the party crossed over to the

Gulf, I made a careful search for land-shells among the drift material lying along the edges of a marshy tract about 150 yards from the bay shore. This drift consisted of broken branches and logs from 2 to 8 inches in diameter, masses of twigs and dead rushes and a few weather-worn planks. The Greek captain of the schooner "Louisa" advised me to use extreme caution in working through the drift, as ground rattlesnakes (*Sistrurus miliarius* L.) were supposed to be abundant on this portion of the peninsula. The snakes, however, failed to materialize.

In the course of an hour I found nearly 250 shells, representing eleven species. The only living specimens in the lot were three examples of *Succinea concordialis* Gld., which were attached to the under side of a plank. The balance of the lot consisted of dead shells, but the majority were in good condition, some even retaining the epidermis. The following is a list of the species obtained;

Polygyra dorfeuilliana Lea. Numerous examples in good condition. This is probably the southernmost record for this species. Pilsbry (Proc. Acad. Nat. Sci. Phila., 1907, p. 535) records a single example from Galveston, but suggests that it may have been imported. I found one specimen on the B. Y. P. U. camp-ground at Palacios. It was a dead shell in good condition and was in a situation that precluded any likelihood of its being a drift shell carried inland through human agency.

Polygyra espiloca Rav. Two examples. This species has been previously recorded from Indianola (Pilsbry).

Polygyra fraterna friersoni Pils.; 14 examples in fair condition.

Polygyra texasiana Mor.

Polygyra mooreana W. G. B.

These two species comprised nearly two-thirds of the entire lot. Living examples of both were found near Palacios.

Polygyra leporina Gld. A single imperfect example.

Polygyra cereolus volvoxis Pfr. Three examples in fair condition. This species has also been recorded from Galveston (Pilsbry) and Virginia Point, Galveston county (Singley).

Succinea concordialis Gld. Three living specimens and a number of dead ones.

Helicina orbiculata tropica Jan. Abundant. Living examples at Palacios.

Praticolella berlanderiana Mor. Abundant. Living at Palacios.

Melampus flavus Gmel. Abundant.

These shells were not intermingled with marine forms, which strew the shore on both sides of the peninsula. The identifications are by Bryant Walker.

ON THE VALIDITY OF UNIO UNDATUS BARNES.

BY BRYANT WALKER.

This species, which is apparently easily identifiable, has been buried in the synonymy for over half a century. A careful study both of the literature and of a considerable amount of material has convinced me that it is entitled to recognition as a valid species.

The synonymic history of the species is, briefly, as follows; It was described by Barnes in 1823 (Am. Jour. Sci. VI, p. 121, pl. IV, fig. 4) and was based on specimens collected by Schoolcraft in the Wisconsin and Fox rivers.

In 1828, Hildreth (Am. Jour. Sci. XIX, p. 280) recognized the species among the *Unionidæ* of the Muskingum river, Ohio, and as his paper was submitted to Barnes before publication, there is apparently no doubt but that his identification was correct.

In his first attempt at an arrangement of the North American *Unionidæ* in 1829 (Obs. I p. 32) Dr. Lea considered it as a synonym of *U. mytiloides* Raf.

In 1833, (Obs. I p. 200) after his return from Europe, where he had studied the Lamarckian types, he declared Barnes' species to be the same as *U. obliquus* of that author.

In the meantime, in 1831, Lea (Tr. Phil. Soc. IV. p. 110 pl. XVI fig. 40) had described his *Unio trigonus* from the Ohio as a new species.

It is to be noted that Barnes died in 1828 before *trigonus* was described, so that he was not able to express his opinion as to the validity of Lea's species.

In 1834, Conrad in his "Synoptical Table" (New F. W. Shells p. 72) considered the two species as synonymous and gave *undatus* priority.

In the same year, Say in his "Synonymy" (Amer. Con. Pt. VI) did the same.

Ferussac in 1835 (Guer. Mag. I p. 28), after Dr. Lea had visited

him in Paris and identified his collection and who had had apparently before him authentic examples of both *undatus* and *trigonus*, came to the same conclusion. He disregarded Lea's reference of *undatus* to *obliquus* Lam. and considered that species to be something quite different.

In 1849 the Western Academy of Natural Sciences of Cincinnati published a "Catalogue of the Unios, Alasmodontas and Anodontas of the Ohio River and its Northern Tributaries." It does not appear who compiled it. In this list *undatus* is recognized as a valid species with four synonyms; *i. e.*, *cardiacea* Say, *mytiloides* Raf., *obliqua* Lam., and *pyramidata* Lea. *Trigonus* is doubtfully referred to *flavus* Raf., of which *rubiginosus* Lea is considered a synonym.

Kuester (Conch. Cab. Unio, p. 58, pl. XIII, fig. 4, 1852) differs from every other writer in his disposition of the species. He considers it a white-nacred form of *Obovaria retusa* Lam. His figure represents a shell quite different from *undatus* in shape, with the surface heavily sulcate transversely. I have never seen anything like it and whatever else it may be, it certainly is not the *undatus* of Barnes. I have been unable to find any reference to this figure in Simpson's Synopsis.

In 1853 Conrad (Pr. A. N. S. Phila. VI, pp. 243-269) published an elaborate "Synopsis" of the Naides. In this, *undatus* and *trigonus* are recognized as distinct species and in a note the author gives what he considers the distinguishing characters of each. He emphatically repudiates the reference of *undatus* to Lamarck's *obliquus*, which he considers has priority over one of Lea's species.

This was the last revolt against the arrangement adopted by Dr. Lea in 1833.

After this time the preponderating influence of Dr. Lea in determining the nomenclature of the North American *Unionidæ* was sufficient to impress his opinion as to the standing of Dr. Barnes' species upon collectors, and the name practically disappears from the literature except as a synonym of *obliquus* Lam.

Simpson in his recent Synopsis (1900) follows Lea in his disposition of the species.

I.

What is the *Unio undatus* of Barnes?

There is no real difficulty in determining this question, if due con-

sideration is given to the original description and figure. It is without doubt one of the most common species in the upper Mississippi and Ohio drainage systems and is commonly known as *Quadrula trigona* Lea.

Barnes's description is very accurate and his figures (Pl. I, figs. 1 & 2) though rude are quite recognizable. As the final determination of the standing of his species must rest upon them, and the publication in which they appeared is out of date and not easily obtained, both are here reproduced, so that they may speak for themselves. In drawing his description, Barnes followed the prevalent error of the day and reversed the ends of the shell, calling the anterior extremity the posterior and *vice versa*. I have therefore interpolated the proper corrections in this particular in parentheses. The italics are as in the original.

UNIO UNDATUS.

Shell subtriangular, sub-longitudinal, very tumid, waved; lateral teeth, *two* in each valve.

Unio obliqua? M. Lamarck.

Hab. Ouisconsin and Fox Rivers. Mr. Schoolcraft.

Diam. 1. 5. Length 2.1. Breadth 2.2.

Shell thick, disks swelled behind (before), depressed before (behind), anterior (posterior) side slightly produced, rapidly narrowed, angulated; beaks projecting backward (forward) nearly as far as the posterior (anterior) side, elevated and recurved, with the ligament passing between them; anterior (posterior) lunule long heart-shaped and separated by a slightly elevated heel; hinge margin depressed between the beaks; basal margin waved and rounded behind (before), compressed in the middle, angulated before (behind); epidermis horn-color exhibiting a light yellowish-green where the surface is worn or rubbed, wrinkled and finely striated transversely, surface glabrous. Cardinal teeth deeply sulcated and crenated; lateral teeth *two in each valve*; internal or lower one of the left valve small, but distinct and elevated, and both marked with fine dotted striæ. *Muscular impressions* deep, posterior one rough. Naker pearly white.

Remarks. This shell, as will be seen by its dimensions, has a more globose form than perhaps any other *Unio*. It will stand erect

on the posterior (anterior) side, and in this position has something of a pyramidal appearance.

For comparison with the author's figures I have figured (Pl. I, fig. 3) a toptype from the Fox River, Illinois, the proportionate dimensions of which are almost precisely those given by Barnes. The comparative measurements, translating Barnes's figures into millimeters, are as follows :

Barnes's type : Length 55, height 52.5, diam. 37.5 mm.

My shell : Length 53, height 51, diam. 34 mm.

To be of exactly the same proportions as Barnes's shell, the one I have figured should have the following dimensions :

Length, 53, height 50.7, diam. 36.14.

That is, the shell figured, as compared with the dimensions of the type, is proportionately .3 mm. greater in height and 2.14 mm. less in diameter than it should be to conform exactly with the type. But the difference is really too small to amount to anything.

In all other respects, the specimen corresponds with Barnes' description and, making due allowance for the crude drawing, agrees substantially with his figure. I think that there can be no doubt but that the shell I have figured is a typical example of the *undatus* of Barnes.

II.

Is *U. undatus* Bar.= *U. obliquus* Lam.?

If the foregoing identification of Barnes's species is correct, it is clear that *undatus* is not the same as the species, which is to-day universally accepted as the *obliquus* of Lamarck. For comparison with *undatus* I have figured (Pl. II, fig. 3) a specimen of the species now known as *obliquus*, of substantially the same dimensions as Lamarck's type.

A comparison of this figure with those of Barnes needs no demonstration to show that the two forms are not the same species.

What species Lamarck really had before him when he described his *obliquus* is by no means free from doubt.

His original description is as follows :

" *U. testa sublongitudinali, ovato-rotundata, obliqua, sub-epiderme candida; ligamento subduplici; dente cardinali crasso, sulcato, bipartito. * * ** Habite la riviere de l'Ohio. A. Michaud. Distincte de la précédente (ligamentina) par sa forme : elle est renflée vers les crochets,

déprimée vers l'autre extrémité, bisillonnée sur le coté antérieur. Longueur apparente, 61 millimètres. "

This description taken by itself is too imperfect to be recognizable. Dr. Lea himself so declared in 1829 (Obs. 1 p. 36) and consequently omitted it entirely from his Synopsis of that date.

Prior to Dr. Lea's visit to Paris in 1832, owing to the indefinite character of Lamarck's descriptions, there was great uncertainty and considerable diversity of opinion among American conchologists in regard to nearly all of his species. And it was no doubt owing to that fact, that Barnes, in describing his *undatus*, intimated that it might be the *obliquus* of Lamarck. Dr. Lea never figured or described *obliquus*. But there can be no doubt but that the well-known species, which for the last fifty years at least has been called by that name, was determined by him as being the Lamarckian species.

But his decision did not meet with universal acceptance.

Ferussac in 1837 (*loc. cit.*), in whose possession were many of Lamarck's types, and who no doubt had access to the type of *obliquus*, which was then in the museum in the Garden of Plants at Paris, and after Dr. Lea had spent eight mornings critically examining and identifying his collection of American *Unionidæ*, believed that Lamarck's *obliquus* was the species described by Lea as *ebenus*.

And Conrad in his "Synopsis" of 1853 held to the same opinion, remarking that "Lamarck's description is wholly inapplicable to *undatus*, which is not oblique, and certainly not "*ovate-rotundate*."

What Lamarck's *obliquus* really is, can probably be only determined by a critical re-examination of the original type, if it is still in existence.

But whatever it may be, it is certain that if the current acceptance of *obliquus* is correct, then it is clear that Lea's reference of *undatus* to it was erroneous. On the other hand, if Lee was right in his determination, then it is equally certain that the species now known as *Quadrula obliqua* cannot bear that name.

What it should be called in that case is "another story" as Kipling would say and may well be held in abeyance until we know what Lamarck's *obliquus* really is. And until that is definitely determined, it is, no doubt, the better part to consider the shell we call *obliquus* to be Lamarck's species and for the time being to deal with Barnes's species on that basis.

(*To be continued.*)

BOSTON MALACOLOGICAL CLUB.

A few persons interested in the study of Mollusca were entertained on the evening of Washington's birthday, by Mr. Francis N. Balch, at his home in Jamaica Plain. Plans were discussed and a meeting for organizing was called. As a result, thirteen met on March 14th, in Boston, adopted a constitution, and elected Prof. Edward S. Morse, of Salem, President; Mr. Francis N. Balch, of Boston, Vice-President; Rev. Henry W. Winkley, of Danvers, Secretary and Treasurer. Mr. John Ritchie, Jr., and Mr. Chas. W. Johnson were elected to serve with the other officers as an Executive Committee.

At the April meeting, Professor Morse gave an excellent address, protesting against the multiplication of generic names, and on some interesting points for study and observation. Mr. Balch spoke on his recent visit to Washington, of some of the interesting specimens obtained by the "Albatross" and of the work being done at the National Museum on mollusks. Some twenty-five ladies and gentlemen are now on the roll of membership.

HENRY W. WINKLEY,
Secretary.

NOTES.

Professor Robert Parr Whitfield, curator in the American Museum of Natural History, author of important works on paleontology, died on April 6, at the age of eighty-two years.

A NEW SPECIES FOR THE UNITED STATES FAUNA. Mr. W. H. Over of Date, S. D., has recently to me for determination specimens of a *Segmentina*, collected by him in a small water-hole among the Coteau Hills, five miles north-east of Clear Lake, S. D. They agree very exactly with the description and figure of *S. christyi* Dall, both in sculpture and size, the largest specimen being $11\frac{1}{2}$ mm. in diameter, and I have no doubt as to their being that species. None of the seven specimens sent show any indications of apertural lamellæ.

BRYANT WALKER.

A LARGE FOSSIL TRIVIA: Among a collection of Pliocene fossils obtained by Mr. Wm. F. Clapp, from the dredgings in the lower part of Lake Flint, above Ft. Thompson, Florida, was a specimen of *Trivia pediculus* of an unusually large size. The specimen measures 22 mm.

in length, and except for size represent the typical *pediculus*, i. e. those with the finer ribbing, about 18 ribs showing on the inner margin of the outer lip, with about 7 intermediate ones which do not reach the inner margin. A study of the recent forms seems to warrant the varietal name of *T. pediculus permagna*.

In a large series of over 100 recent specimens there is a great range of variation; the largest is 17 mm., the smallest 6 mm., in length. The larger specimens show a noticeable uniformity in size, about fifty percent measuring between 15 and 17 mm. The specimens from near Jupiter Inlet, Fla., represent for the most part the variety *labiosa* Gask., with a perceptibly broader inner lip, with about 15 ribs extending to the inner margin. The variety *cimex* is smaller (about 8 to 10 mm.), and in the typical form there is a tending for the spots on the right side to become confluent.

C. W. JOHNSON.

FULGUR CANALICULATUM SPAWNING in the New York Aquarium is figured and described in the Zoological Society Bulletin for March, 1910, pp. 637, 638. Eight days were occupied in spawning one string of egg capsules.

AN EARLY STAGE OF ACMÆA. By EDWARD S. MORSE (Proc. Boston Soc. Nat. Hist., vol. 34, pp. 313-323, 1910). An exceedingly interesting paper in which the author shows that the young of *Acmæa testudinalis* is not nautiloid, but begins with a blunt cæcal-like cap without the suggestion of a coil. The specific characters separating *A. testudinalis* and *A. alveus* are also fully discussed.

NEW OLIGOCENE SHELLS FROM FLORIDA. By CARLOTTA JOAQUINA MAURY (Bull. Amer. Paleontology, vol. 4, No. 21, March, 1910). This Bulletin contains the descriptions and figures of 84 new species, principally from the Oak Grove and Chipola marls. The types are either in the Cornell University or the collection of Mr. T. H. Aldrich.

PALEONTOLOGY OF THE COALINGA DISTRICT, CALIFORNIA. By RALPH ARNOLD (Bull. 396 U. S. Geol. Survey). Over 50 new forms of tertiary mollusca are described and figured. *Carinifex marshalli*, proposed for *C. newberryi* Cooper (not Lea) has evidently already been named by Mr. Harold Hannibal *C. santaclaræ*, NAUTILUS, vol. 23, p. 40, July, 1909.

THE NAUTILUS.

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No. 2

A NEW CLAIBORNIAN SHELL.

BY REV. H. E. WHEELER.

OVULACTÆON ALDRICHI, n. sp.

Shell minute, subcypræform, thick, longitudinally sculptured with distinct grooves very closely set, and terminated by the broad oblique callus on the body whorl; periphery of the apical region smooth, well rounded, the diameter of the perforation being contained in the width of the shell about four times; aperture linear, very contracted, elevated; outer lip thickened, reflected over and close to the apical perforation, and produced downward on the body whorl; furnished behind with an oblique, rather deep furrow, which is parallel to the labial contour, and terminating at the callus, a similar, less prominent rectilinear furrow directly in front.

Length 4 mm.; width 2 mm.

Type (No. 779, Col. Wheeler) from the Ferruginous Sand Bed, Claiborne, Alabama. Co-type in the collection of Hon. T. H. Aldrich.

The genus to which this shell belongs is new to Eocene paleontology. Thus far it is represented only by *O. meeki* Dall, a recent form dredged off the coasts of Cuba and the Bahamas. The genus is thus characterized by Dr. Dall:¹

“Shell cypræform, involute; with an apical perforation as in *Bulla*;

¹ Bull. Mus. Comp. Zool. Cambridge, vol. xvii, 1889, p. 42.

columella simple, without plaits; margin of the aperture continuous, simple, thickened, the callus on the body whorl elevated parallel with the outer lip; aperture narrow, almost linear, slightly effuse at the extremities, as long as the shell.

"Type *O. meekii*, Dall. Plate 33, figs 3 and 4."

I dedicated this interesting shell to my friend, Hon. T. H. Aldrich, of Birmingham, Alabama, who solved the problem of its generic position, and whose contributions to our knowledge of Tertiary Paleontology are so well known and highly valued. It will be figured on a future plate of this volume.

NOTE ON THE GENUS *PTERIDES*.

BY H. A. PILSBRY.

In my study of this group of Mexican freshwater shells I overlooked an important article by the late Professor Sp. Brusina in the *Nachrichtsblatt der Deutschen Malak. Gesellschaft* for 1906, p. 154, in which he erects the new genus *Lanzaia* for the long-forgotten *Turbo elephantotus* of Megerle von Mühlfeldt, described in 1824 from the coast of Dalmatia, and rediscovered by Prof. Brusina, on the seashore near the mouth of the little river Zernovica.

This snail, *Lanzaia elephantota* as it will now be called, which is well figured in the *Nachrichtsblatt* (p. 158), has the aperture formed like that of my *Pterides pterostoma* (*Nautilus* xxiii, pl. 5, figs. 1, 2). It differs from the Mexican *Pterides* by having sinuous flat-topped riblets with close, fine spiral striæ in the intervals, and a rather large umbilicus. The Mexican *Pterides* has a smooth surface, merely rimate umbilicus, and more elongate shape.

The finding in Mexico of Mediterranean region genera, such as this one, *Emmericia* and *Coilostele* is extremely interesting and important. The more prominent groups of freshwater shells are widely diverse.

DESCRIPTIONS OF TWO NEW SPECIES OF POTAMOLITHUS.

BY H. VON IHERING, SAO PAULO, BRAZIL.

P. PAYSANDUANUS n. sp.

Shell imperforate, solid, globose, olivaceous, nearly smooth. Spire very short, conic, the apex eroded. Last whorl swollen below the suture, rounded at the base and periphery. Aperture somewhat oblique, ovate. Peristome continuous, obtuse, black, the outer and basal margins narrow, columellar and parietal margins wide, flat and black. Length 4.8; diam., 3.9 mm. Paysandú, Uruguay.

This species occurred in three forms: (1) that described above as typical.

(2) Form *sinulabris*, similar to the preceding, but with a sinus in the upper part of the outer lip.

(3) Form *impressus*, larger, with a concave zone at the upper part in the last half whorl, and a sinus in the lip, which is thin and sharp.

P. FILIPPONEI n. sp.

Shell imperforate, pyramidal, olivaceous with a reddish-brown band at the penultimate whorl, smooth. Whorls 5, strongly convex, the last strongly bicarinate, one carina peripheral, the other basal, bounding a large concave umbilical area. Aperture very oblique. Peristome continuous, outer lip thin, unexpanded, having small rounded sinuses near the upper insertion, below the peripheral angle, and at the base of the columella, which is narrow and straight. Length 4.4, diam. 4 mm.

Montevideo, Uruguay, type in Museu Paulista, collected by Dr. Florentino Filippone.

COMMON OR VERNACULAR NAMES FOR MUSSELS.

BY DR. V. STERKI.

While collecting along the Ohio River, I had some dealings with the shell hunters, the men gathering clams for the button factories,

and at the same time looking for pearls. They have some common names for certain kinds of mussels; and an official of button factories I met at Marietta, was kind enough to verify the names and to give some additional information.

"Mucket." *Lampsilis ligamentina*, also *orbiculata*.

"Pig-toe." *Quadrula obliqua*, and the whole group of approximately the same shape, also *subrotunda*, *æsupus*, etc.

"Warty pig-toe." *Q. cooperiana*, *pustulosa*, etc.

"Nigger-head." *Q. ebena*; sometimes also *Obovaria retusa*.

"Monkey face." *Q. metanevra*.

"Butterfly." *Plagiola securis*.

"Pocketbook." *L. ventricosa*, also *capax*.

"Sand clam," or "Black sand clam." *L. recta*, occasionally also *Unio gibbosus*.

"Lady's finger." *L. anodontoides*, no doubt also *fallaciosa*.

"Three-ridge washboard," or "Three-ridge," or "Washboard." *Q. undulata*, also *plicata*, and *multiplicata*.

"Razor-back," "Rudder-back," "Hatchet-back." *Proptera alata* (and, no doubt, *Symphyn. complanata*).

Some other large and common mussels may have common names, but I failed to find them out, e. g. *U. crassidens*, *Tritogonia*, *Q. lachrymosa*.

ON THE VALIDITY OF UNIO UNDATUS BARNES.

BY BRYANT WALKER.

(Concluded from p. 10.)

III.

Is *U. undatus* Bar. = *U. trigonus* Lea.

Lea's description of his *trigonus* is as follows:

"Shell subtriangular, inflated, nearly equilateral, depressed before the umbonial slope, angular behind; umbonial slope carinate; basal margin emarginate; substance of the shell thick, beaks prominent,

incased and slightly undulated at the tips; ligament short and thick; epidermis brown; rays obsolete; cardinal tooth large, elevated and widely cleft in the left valve and emerging from a pit in the right valve; lateral teeth thick and curved in a direction over the cardinal tooth; anterior and posterior cicatrices both distinct; dorsal cicatrices situated on the under part of the cardinal tooth; cavity of the beaks deep and angular; nacre pearly white and iridescent. Length 2.3; alt. .2; diam. 1.5 in."

It is to be noted that while this description is quite exactly in accord with the Ohio river species commonly called *trigonus*, the figure, while its dimensions are those given in the description, is not in strict accordance with its specifications nor with the shell as usually found. The shell as figured (Pl. II, fig. 1) would scarcely be called "subtriangular," but rather subquadrate; the beaks though prominent are not characteristic of the shell as it actually occurs and there is a decided emargination of the posterior slope, which is not mentioned at all in the description, and which, so far as my experience goes, does not occur in any form of *trigonus*. The figure, as it stands, would do better for a representation of the not uncommon quadrate form of *rubiginosus* than of *trigonus*.

It was probably on this account that the Western Academy of Natural Sciences, in their "Synopsis" of 1849, felt unable to determine exactly what *trigonus* was and doubtfully referred it to *flavus* Raf., of which they considered *rubiginosus* an unquestionable synonym.

Dr. Lea in his "Rectification" (Separate p. 6) speaks in the highest terms of the judicial attitude maintained by the Academy in the preparation of this list and of the impartiality with which they attempted to "render strict justice to every author."

It is to be noted in this connection that the figure of *U. pyramidalus* on Lea's plate is evidently exaggerated and out of proportion and that of *rubiginosus* in the same volume is even more so. It would therefore seem that the figure given cannot be confidently relied upon as an accurate representation either of the species or of the type.

But, however that may be, there is no real question as to what Lea's species is, although it does not appear to be a common one in the Ohio River. I have myself seen only one specimen, that figured (plate II, fig. 2). Of sixty specimens of the group recently submitted by Dr. V. Sterki for examination from the Ohio at Marietta and

intended to be a representative series of the fauna of the river at the place, not a single specimen could be satisfactorily referred to "*trigona*." It would seem as though it did not extend up the river as far as that place.

It is unquestionable that the form I have identified as the *undatus* of Barnes has for the last half-century been uniformly considered to be the *trigonus* of Lea.

It is also true that prior to 1850, Lea's species was considered to be the same as Barnes's by a very large and respectable element among the conchologists of that time.

It is evident, also, that Dr. Lea had considerable difficulty in enforcing the adoption of his disposition of *undatus* (Syn. 4th, Ed., p. 38 n; Rectification 1st Ed. p. 15) at that time.

In considering the question *de novo* it must be admitted at once that the typical forms of the two "species" are not exactly the same.

Conrad in a note to his last Synopsis (1853), in which he considers the two forms to be distinct species states the difference aptly: it (*undatus*) "is much more ventricose anteriorly and over the umbo than *trigonus*; has more elevated beaks and is very inequilateral, whilst the latter is nearly equilateral." Dr. Lea remarks (Syn. 4th Ed. p. 38 n 3) that *trigonus* is always more angular on the umbonial slope and the undulations at the tip of the beaks differ."

This comparison does not apply to the true *undatus* of Barnes, but is correct in the first item when applied to *obliquus*, with which he considered Barnes's species to be synonymous. I have not been able to ascertain the beak characters of *obliqua* from the material at my disposal.

In considering Lea's conception of his species and whether he considered it to include the form believed to be the real *undatus* of Barnes, it may be of service to note his treatment of both species before and after his identification of *undatus* with *obliquus* in 1832.

In his original description of *trigonus* (Obs. I, p. 121) he remarks that his species belongs to the group of species which are known as *mytiloides* Raf. and has been considered a variety of that species, but that he believes that the group may be divided into four species, *mytiloides* Raf., *undatus* Bar., *pyramidatus* Lea, and *trigonus* Lea.

It is to be noted that this was before he had identified *undatus* with *obliquus*, but tends to show that he even then identified Barnes's species with the form, which he subsequently declared to be *obliquus*

Lam., which at that time he had been unable to identify from the original description. In his description of *Unio solidus* (Obs. II, p. 13), read Dec. 19, 1834, he compares that species with *undatus* and distinguishes it by "being more rounded at the basal margin, by its more elevated beaks and by its color."

In his description of *Unio planus* (Obs. III, p. 51), read Oct. 2, 1840, he differentiates that species from both *obliquus* and *trigonus* as being more rounded at the base, the emargination being very small and being higher in the beaks than *trigonus* and more flattened there than *obliquus*.

In the same paper he remarks (p. 54) that his *dolabelloides* stands between *undatus* and *cor*.

It is curious to note that as late as Feb. 19, 1841, he seems still to ignore *obliquus* on occasion and to use *undatus* (Obs. III, p. 69).

But after that date, *undatus* is not referred to except in his Rectification and Synopses.

In his description of *Unio tumescens* (Obs. iv, p. 45), read May 2, 1845, he says that that species is allied to *trigonus*, but differs in being more rounded and in having rays. The comparison is certainly not a very apt one to say the least.

In his description of *Unio chunii* (Obs. ix, p. 18), read June 3, 1862, he states that this species is closely allied to *trigonus*, but may be distinguished by being more lenticular in form and in not having so sharp an umbonial slope. The undulations of the beaks of that species, however, are few, as in *trigonus*, and follow down the angle of the umbonial slope. In the same paper (p. 21) in his description of *Unio riddellii*, he remarks that that species belongs to the group of which *trigonus* may be considered the type, but differs in being rounded, even more inflated and in the character of the undulations, which are "remarkably close," while in *trigonus* they are few and follow down the angle of the umbonial slope for a short distance."

It is evident from these comparative remarks that, in Lea's mind, *trigonus* was a shell with prominent beaks, though less so than in *solidus* and *plenus*, with a rather wide basal emargination, a sharp umbonial angle, and having the beak's undulations few and following down the umbonial angle for a short distance.

These specifications apply accurately to the shell above identified as *undatus* Barnes, and do not apply to any other *Quadrula* of the Ohio drainage.

Of the fourteen species included in the "*trigona* group" by Simpson in his excellent arrangement, seven are found in the Ohio River, viz.:

Q. rubiginosa.

Q. coccinea.

Q. trigona.

Q. solida.

Q. obliqua

Q. plena.

Q. pyramidata.

Of these *coccinea* is quite different from any of the others, and possibly does not belong to the genus at all. (Ortmann, Naut. XXII, p. 10.) At any rate it is so entirely distinct from *trigona*, *undata* and *obliqua* that it may be dismissed from further consideration in this connection. The remaining species may be separated into two very natural groups by a characteristic difference in the form and position of the pseudo-cardinals. In his description of *trigonus*, Dr. Lea states that the "cardinal(is) large, elevated and widely cleft in the left valve and emerges from a pit in the right valve." This is absolutely correct and is one of the most characteristic specific details.

The pseudo-cardinal of the left valve is composed of two deltoid teeth separated by a deep, triangular cavity for the reception of the pseudo-cardinal of the right valve. At their upper extremity they meet and in most cases are completely fused together so that they might well be termed a single "widely cleft tooth" rather than distinct teeth. The anterior tooth is high and sharply beveled upwards to a narrow, nearly rectilinear edge, which is nearly parallel with the lower margin of the lunule. The cavity between them is deep and comparatively narrow and extends obliquely backward and upward until terminated by the fused extremities of the pseudo-cardinals. The pseudo-cardinal in the right valve is triangular in shape, with a sharp apex directed toward the beak. The posterior side is short and nearly straight up and down; the anterior side is much longer and more oblique. On both sides are deep cavities for the reception of the pseudo-cardinals of the left valve, and owing to the fusing of the upper extremities of these teeth these cavities are continued entirely around the pseudo-cardinal, which consequently appears to be "emerging from a pit."

The space between the pseudo-cardinal and lateral teeth ("interdentum") is comparatively narrow. This is clearly shown on both Barnes's and Lea's figures. This arrangement of the pseudo-car-

dinals is also characteristic of *rubiginosus*. In the remaining four of the species above mentioned, the character and relative position of the pseudo-cardinals are quite different, and are similar in all.

Taking *obliqua* as an example, the interdentum is very broad. The posterior pseudo-cardinal of the left valve is low and broadly triangular in shape and the blunt apex points obliquely forward and not directly upward; the anterior pseudo-cardinal is very low and bends around the broad and comparatively shallow socket for the opposing pseudo-cardinal. This socket is almost quadrate in shape, extends obliquely forward and a line from the upper to the lower corner is almost perpendicular. The pseudo-cardinal of the right valve is broadly triangular, and the anterior and posterior sides are about equal. It is surrounded above by a "pit" which is very shallow in front of the tooth and longer and shallower behind the tooth than in the *trigonus* group, triangular in shape and quite oblique.

The whole effect of the hinge in this group is that all the teeth are subparallel and project obliquely backwards from the beak; while in the *trigona* group the pseudo-cardinal and lateral teeth met at a decided angle under the beak.

This arrangement of the hinge in *obliqua* and its allies sensibly affects the external form of the shell, so that there is seldom any occasion for mistaking to which of the two groups any particular shell belongs.

It would seem clear, therefore, that there is no occasion for confounding the *undatus* of Barnes with any of the four species grouping about *obliqua* and that in seeking to identify that species, *obliqua* and its allies may be dismissed from further consideration.

If this be conceded, then it follows that Lea's *trigonus* is either identical with *undatus* or *rubiginosus* or is a district species from either. That the *trigonus* of Lea is specifically distinct from his *rubiginosus* does not require argument in spite of the tentative union of the two species by the Western Academy of Nat. Sciences caused no doubt by the uncharacteristic figure given by Lea of his type.

Rubiginosus is well characterized by its more broadly triangular or subquadrate and more compressed shape and less prominent beaks, which are less incurved at the tips, and the lack of the pronounced angle on the posterior ridge.

The possibility that *trigonus* and *rubiginosus* can be specifically identical may be consequently most emphatically answered in the

negative. It follows therefore that *trigonus* is identical with *undatus* or is a distinct species.

In considering this question, it is to be borne in mind that nearly all of our *Unionidæ* are subject to a large amount of variation and that the wider the range of a species, the greater the amount of variation it exhibits under the influences of diverse conditions of local environment.

Trigonus (using the term in its broad, current acceptation and not confining it to the form of Lea's type) has a very extensive range.

In the Mississippi Valley from Minnesota (Grant) south to Arkansas (Call) and northern Louisiana (Frierson); in the Ohio drainage it ranges east through Ohio (Sterki) but apparently does not extend into Pennsylvania (Ortmann) nor southwestern N. Y. (Marshall); through the ancient post-glacial connections of Lake Michigan with the Mississippi and Lake Erie with the Ohio, it has invaded the St. Lawrence system and is found in the lake drainage of Wisconsin, Illinois and southern Michigan, whence it ranges east as far as Buffalo, N. Y. (Marshall) and Port Dover, Ont. (Whiteaves), but does not appear in the valley of the Ottawa (Latchford); in Kentucky it has been recorded from the Barren River (Walker) and Warren Co. (Price) in the Ohio drainage; apparently it does not occur in the Tennessee drainage area at all; but, curiously enough it reappears in the Alabama system where it is usually, but erroneously, called *chunii* Lea.

Through Texas, southern Louisiana and Mississippi, the *trigona* group is represented by a number of "species," whose relations with each other and with *trigona* are uncertain, and can only be definitely determined by a much larger amount of material than is apparently accessible at the present time. *Trigona* as such, so far as I have been able to ascertain, has not been listed from any of those States except northern Louisiana.

While *trigona*, commonly so-called, throughout this enormous extent of territory sustains its specific identity sufficiently to be recognized in most cases without difficulty, yet, as might be expected, it exhibits in different parts of its range a considerable amount of variation.

Thus in the Mississippi, Illinois and Fox rivers, the high triangular form, which I have identified with *undatus*, is the prevalent phase; in the Ohio a more equilateral form (typical *trigona*) occurs

and similar shells are before me from the Wisconsin river, Sauk Co., Wis., and the Mississippi River at Davenport, Ia.; while in the Kaskaskia and Spoon rivers, Ills., a shell more broadly triangular in form is found, which apparently represents the extreme in that direction. The Alabama form is closer to typical *undatus*, but like many of the northern species, that have obtained a foothold in that system and retained their specific identity, is apparently uniformly smaller and resembles a half-grown example of the common Mississippi expression of the species.

But taking the series thus specified as a whole, it exhibits a similarity throughout, which is congruous only with specific identity and which separates it as a whole from union with any other described species. And in this assemblage and united by a series of unmistakable intermediates are the *undatus* of Barnes and the *trigonus* of Lea.

If, in addition to what has already been said, anything further is needed to prove the identity of the two forms, the following comparison of the specific characters of the two species as given in the original descriptions will show that there is no ground for questioning their specific identity.

<i>Undatus.</i>	<i>Trigonus.</i>
Subtriangular.	Subtriangular, nearly equilateral.
Disks swelled before, depressed behind, posterior side slightly produced, rapidly narrowed, angulated.	Inflated, depressed before the umbonial slope, angular behind, umbonial slope carinated.
Basal margin waved.	Basal margin emarginate.
Shell thick.	Substance of shell thick.
Beaks elevated, recurved, projecting forwards nearly as far as the anterior side.	Beaks prominent, incurved.
Ligament passing between the beaks.	Ligament short and thick.
Epidermis horn-colored, wrinkled and finely striated transversely, surface glabrous.	Epidermis brown, rays obsolete.
Cardinal teeth deeply sulcated and crenated.	Cardinal tooth in the left valve large, elevated and widely cleft.

Lateral teeth two in each valve.	Lateral teeth thick and curved in a direction over the cardinal tooth.
Muscular impression deep, posterior one rough.	Anterior and posterior cicatrices both distinct.
Nacre pearly-white.	Nacre pearly-white and iridescent.
Length 2.2. in.	Length 2.3 in.
Alt. 2.1 in.	Alt. 2.0 in.
Diam. 1.5 in.	Diam. 1.5 in.

If then, our contention is correct as to the absolute specific identity of the two species, priority must be given to Barnes's name and the synonymy must be written as follows:

QUADRULA UNDATA (Barnes).

1823, *Unio undatus* Barnes, Am. J1. Sci. VI, p. 121, pl. IV, fig. 4.

1831, *Unio trigonus* Lea, Tr. Am. Phil. Soc. IV, p. 110, pl. XVI, fig. 40.

EXPLANATION OF PLATES I AND II.

Pl. 1 fig. 1. *Q. undata*, Facsimile of one of Barnes's figures.

Pl. 1 fig. 2. Copy of Barnes's other figure.

Pl. 1 fig. 3. *Q. undata*, Fox River, Ill. (original).

Pl. II fig. 1. Facsimile of Lea's figure of *Unio trigonus*.

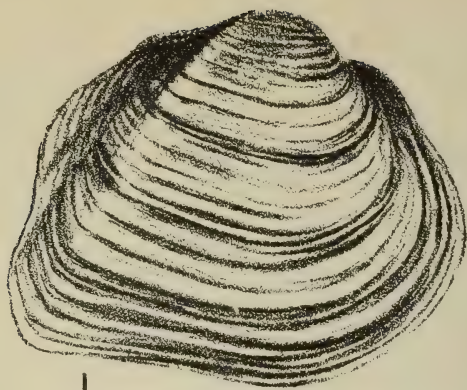
Pl. II fig. 2. *Q. trigona* Lea, Ohio River (original).

Pl. II fig. 3. *Q. obliqua* Lam. Paint Rock River, Jackson Co., Ala. (original).

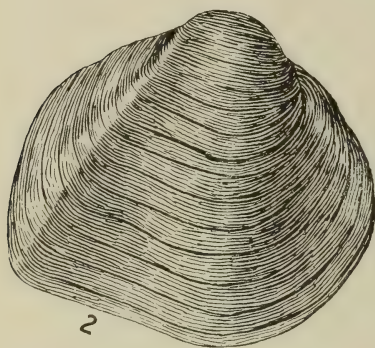
NOTES.

THREE SHELLS NOT HITHERTO REPORTED FROM THE DISTRICT OF COLUMBIA.—Recent collecting has added the following hitherto unreported shells to the fauna of the District of Columbia or its environs: *Polygyra palliata* Say (on the Virginia side of the Potomac near Great Falls); *Zonitoides milium* Morse, *Punctum pygmæum* Drap.—G. DALLAS HANNA.

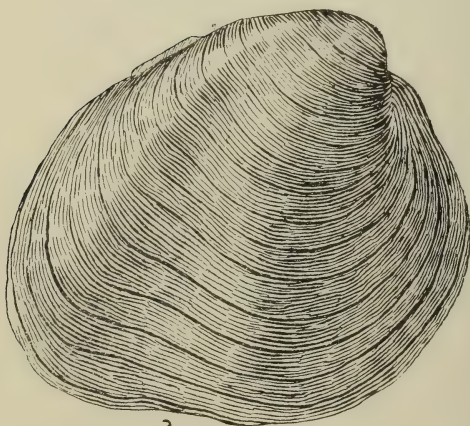
The albino *Oliva angulata*, noticed in the March number, has now found a home with the Academy of Science at Minneapolis, Minn.—A. L. HETTRICH.



1

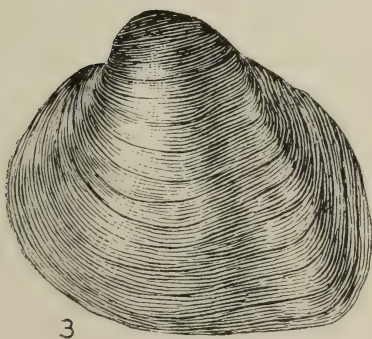
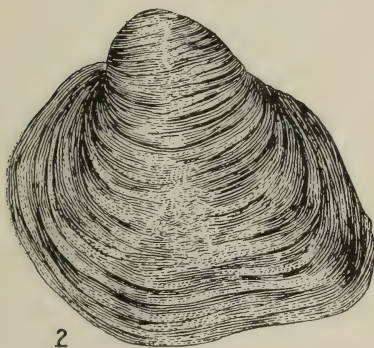
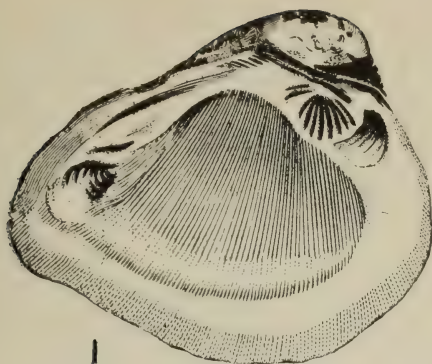


2



3

1, 2, QUADRULA TRIGONA LEA.
3, QUADRULA OBLIQUA LAM.



QUADRULA UNDATA BARNES.

THE NAUTILUS.

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NO. 3

SHELL COLLECTING IN PUGET SOUND AND ALASKA.

BY DR. FRED BAKER, SAN DIEGO, CAL.

During the last summer it was my good fortune to take a most enjoyable trip to Seattle, Washington, where the Alaska-Yukon-Pacific Fair was in full swing; to the San Juan Islands in Puget Sound, where the Summer School of the University of Washington was in session; and on to Alaska, reaching a point as far west as Cook's Inlet. At all points possible I collected shells, and a full list of species and localities follows at the end of this article. It is a grateful task to acknowledge help in naming all doubtful species at the hands of Dr. W. H. Dall and Dr. Paul Bartsch of the National Museum, and the Rev. Geo. W. Taylor of Nanaimo, British Columbia. Without their help this article could only have been an account of the wanderings of a very amateurish conchologist.

The University of Washington, in connection with several other institutions which join forces with her, conducts a summer school on a group of islands in Puget Sound,—there are a hundred and fifty of them which constitute the county of San Juan in the State of Washington,—and here my wife and I dropped down on about fifty of the best people on earth, as biologists always are. This year they were trying the experiment of doing work in two places, and we arrived just in time to help them move camp from San Juan Island to Olga, on Orcas Island, thirteen miles away.

Orcas Island, the second largest of the group, supports a considerable farming population, but is much broken, and boasts a peak, Mt. Constitution, 2660 feet high, from which we had a glorious pano-

ramic view in all directions over thousands of square miles of water with scores of islands, and the mainland rising foothill above foothill to the Olympics and the Selkirks with their snowy ranges, and dominating and crowning all, the splendid peaks of Mt. Baker and Mt. Rainier.

We were soon established in camp quarters after our arrival, and regular work got under way. Here I met for the first time Dr Kellogg of Williams College, who was doing some most interesting work on the siphonal currents of the pelecypods. Others were doing equally interesting original work in various lines of botany and zoology, but of course the dredging was most important from my point of view. Their dredging was done by a regular shrimp dredger who was employed by the season. The apparatus is crude but very efficient. A trawl twelve feet wide was used, and as the water is shallow everywhere, the boat only carried about fifty fathoms of cable. No soundings were taken, but the depths, which generally varied between ten and thirty fathoms, were ascertained from the charts. I have done considerable work with the Alexander Agassiz, the boat of the Marine Biological Association of San Diego, and I spent five days aboard the Fish Commission Steamer Albatross off San Diego, but I have never seen such a wealth of material as we got at all stations. The great trawl always filled in a few minutes, but I was impressed by the fact that the variety of species was not nearly so great as in our more southern waters. As no one was specially interested in mollusks, I was allowed the privilege of taking any of the dredgings which I could handle. In fact we were royally treated by everybody at the station, and I shall always count the ten days we spent there as "the best yet."

A week later we were on our way to Alaska, that country of which some one has said, "If you are old, go by all means; but if you are young, wait. The scenery of Alaska is much grander than anything else of the kind in the world, and it is not well to dull one's capacity by seeing the finest first." As representatives of one of our local papers we were a part of the National Editorial Association, and as far as we went all Alaska was ours for the asking. The usual Alaska trip consists of a run from Seattle up to Skagway and back, the whole distance with the exception of a dozen miles or so being in land-locked channels, often only a few hundred yards wide, bounded by steep, heavily wooded mountains on either hand. Various towns of much

interest are visited, and a side trip up Taku Inlet shows the great Taku and Windom Glaciers. Formerly Glacier Bay was visited for a view of the Muir Glacier, but the immense amount of float ice and icebergs which have formed within the last two or three years make this visit unsafe and it has been abandoned.

On our trip we saw all that the regular tourist sees, and for full measure we ran west from Juneau into the open ocean, making a run of several hundred miles to Prince William Sound and Cook's Inlet. As we ran out of the still waters of Cross Sound into the open ocean early one morning on our right opened up the Fairweather range, one of the finest mountain ranges in all Alaska. One after another the great peaks came into view, until the whole range was off our starboard side. Many mountain ranges do not show their full extent, as to be seen the foothills must be crossed, and one's own elevation cuts down the apparent height. Here the range comes to the very ocean, and the overpowering sense of altitude is there. Four peaks rise above 10,000 feet, and Mt. Fairweather towers to 15,292 feet. From one point we could count six great glaciers, making their beginnings in the everlasting snows at the top and winding down like great rivers toward the sea.

At Cordova, on Prince William Sound, a place of 1200 people, which has grown in a year, we were taken inland fifty-three miles on the Copper River Railroad. This road, which is ultimately to reach a veritable mountain of copper, crosses several branches of the Copper River which are making the delta at its mouth, and then goes up the left bank until a point is reached where on each side, and within four miles of each other, a great glacier comes down to discharge its icebergs into the river. The face of each glacier rises sheer 350 to 400 feet, and each is over four miles wide along the river's bank. Opposite the lower, Child's Glacier, at a distance of 1500 or 2000 feet, we amused ourselves taking photographs, and repeatedly were successful in catching the great masses of ice as they broke away. In the face of this body of ice we actually suffered from the heat of the June day.

At Cordova I took advantage of a fine tide to do a couple of hours collecting, being rewarded by several good things, the best being a fine *Mactra* (*Spisula*) *alaskana* Dall. From Cordova we went to Valdez, the point of departure of the great dog teams for the Fairbanks region during the winter, but a very dull town in summer.

A year ago \$700,000 worth of gold was brought out on dog sledges. Unfortunately I was not able to do much collecting here, as it is almost imperative to take a small boat and get away from the waterfront of the town, and there was not sufficient time.

On the return trip we called at Ellamar, a very small mining town on a very small landlocked bay off Prince William Sound, where we had to run in on one high tide and wait for the next to take the ship out. I therefore had my work cut out for me, and, on account of the steady downpour of rain, I donned waterproof and rubber boots, and protected by an umbrella from the heaviest rain, I made the most varied and interesting catch of the Alaskan portion of my trip.

From Prince William Sound we sailed at midnight to Seward on Resurrection Bay. When I turned out in the early morning I found the tide well out and still going down, so I got busy at once. Here I found many things of interest, the best being *Trachydermon raymondi* Pilsbry, of which I succeeded in finding about a dozen. I finished my work well before the call to breakfast, and then we had a fine ride of twenty-five miles over the Alaska Central Railroad, which is now in the hands of a receiver, but was then being investigated by Mr. Geo. W. Perkins, of the firm of J. P. Morgan & Co., with a view to syndicating its completion. Since our return the papers have announced that this would be undertaken in the near future. The road already runs fifty miles into the interior through a region of marvelous beauty, and it has one unique feature of construction. At one point the engineers have blasted out a deep pass directly through a great glacier, which in future will have to be constantly cut away, as it encroaches on the railroad right of way.

From Seward we sailed down Resurrection Bay on a glorious afternoon, passing close to the rugged group of islands at the mouth, and looking back up the whole length of a great white glacier directly to the setting sun which was painting everything in matchless reds. Then the open ocean, and heavy clouds, and night settling rapidly, and cold winds driving us to our bunks for a much-needed rest.

Morning found us in Cook's Inlet, our most westerly point, and we sailed into the little station of Port Graham just at daylight. As we ran into the small bay where this station lies, we saw across the broad inlet the smoke of St. Augustine, the only volcano we saw which was even active enough to smoke. Aside from this slight

interest, it is a most beautiful mountain, a nearly regular cone rising almost from the water's edge for many thousand feet, and covered with glaring white snow from very near the base.

We spent the whole day at Port Graham, and the tide had run a long way out when we tied up. So it was overalls and rubber boots and a fine hunt of a couple of hours before breakfast. Then a hurried breakfast and three hours more of hunting. The collecting was good everywhere, so I could begin beneath the wharf and work either way. I found *Argobuccinum* (*Priene*) *oregonensis* Redfield, in quantity on the beach, and their numbers made me miss an important possibility. I had secured a considerable number of these shells in dredgings in Puget Sound, but the temptation to take more, which I suppose is the miserly instinct common to most collectors, induced me to throw a lot of them above the tide-line to be picked up later. When the tide had come up beyond the limits of profitable collecting I began to gather in this bunch of shells. Then I found among them four fine specimens of *Chrysodomus liratus* Martyn, which I had overlooked in my hurry, though they are so different that I cannot understand my blunder. It would have been more profitable to have hunted the beaches over for this last species, of which I have little doubt that I could have found as many as I could have cleaned for transportation.

At Port Graham I also found in quantity *Astarte rollandi* Bernardi. This fine shell I had not seen before, and I was glad to add it to my collection. The Indians were running around on the beach and in their bydarkas, and some of them watched me cleaning my catch. I have no doubt that my actions were a puzzle to them. None of them could be induced to talk any English, even if they knew any. However, by laying down ten cents and then tying an *Astarte*, then making use of a sign language invented for the occasion, I was able to interest a small native, and I finally kept him tying my bivalves for a couple of hours. With his help my day's work ran from 4 a. m. to 4 p. m., with very short intermissions for breakfast and lunch, so that on this day at least I felt very tired and very virtuous and slept the sleep of the just during the long night following.

Every hour of our 8000 miles of water travel was most enjoyable, as were the intervening stops, and from the point of view of a collector the trip was eminently profitable. I secured representatives

of 148 species, four of which, *Odostomia cookeana* Bartsch, *Alvania bakeri* Bartsch, *Onoba asser* Bartsch and *Leptogyra alaskana* Bartsch, are new. It is an unfortunate fact that of each of these new species except the *Leptogyra*, I secured only a single specimen, and of the *Leptogyra* I found only half a dozen.

List of Shells Collected.

In the following list the species marked Orcas Island were dredged near Orcas Island, Puget Sound, at depths varying from 10 to 30 fathoms. All other points mentioned are in Alaska except Ballard Beach, a point on the Sound just north of Seattle, Washington, and Sucia Island, a small island north of Orcas.

Purpura foliata Mart. (*Cerostoma foliatum* Mart.). Orcas Island, living and dead, rather common.

Tritonalia lurida Midd. (*Ocenebra lurida* Midd.). Orcas Island, dead, not common.

Tritonalia subangulata Stearns (*Ocenebra subangulata* Stearns = *Tritonalia michaeli* Ford. Orcas Island, a single young specimen, living.

Boreotrophon multicostatus Esch. Orcas Island, two living specimens.

Boreotrophon orpheus Gld. Orcas Island, two specimens.

Boreotrophon tenuisculptus Cpr. Orcas Island, 1 specimen; Port Graham, Alaska, 1 specimen.

Thais (*Nucella*) *decemcostata* Midd. (*Purpura decemcostata* Midd.). Orcas Island; Ballard Beach; Seward, Alaska.

Thais (*Nucella*) *lamellosa* Gmel. (*Purpura lamellosa* Gmel.). Common at all points visited.

Thais (*Nucella*) *lima* Mart. (*Purpura lima* Mart.). Ellamar; Seward; Port Graham.

Thais (*Nucella*) *saxicola* Val. (*Purpura saxicola* Val.). Ellamar.

Thais (*Nucella*) *saxicola emarginata* Desh. (*Purpura saxicola emarginata* Desh.). Ellamar.

Thais (*Nucella*) *saxicola ostrina* Gld. (*Purpura saxicola ostrina* Gld.). Sucia Island, Puget Sound.

Argobuccinum (*Priene*) *oregonense* Redf. (*Triton* [*Priene*] *oregonense* Redf.). Orcas Island; Port Graham.

Chrysodomus liratus Mart. Port Graham, 4 large specimens living.

Chrysodomus tabulatus Baird. Orcas Island, common, living and dead.

Buccinum cyaneum Brug. Ellamar.

Alectrion (*Tritia*) *mendica* Gld. (*Nassa mendica* Gld.). Orcas Island.

Marginella (*Volutella*) *pyriformis* Cpr. Orcas Island.

Columbella (*Nitidella*) *gouldi* Cpr. Orcas Island.

Amphissa corrugata Rve. Orcas Island, common.

Bela fidicula Gld. Orcas Island, 8 specimens living.

Natica clausa Brod. Orcas Island, Port Graham.

Polinices (*Euspira*) *lewisii* Gld. (*Lunatia lewisii* Gld.). Ballard Beach, common.

Polinices pallidus Brod. & Sby. Orcas Island, Ellamar.

Velutina laevigata Fleming. Orcas Island, not rare.

Galerus fastigiatus Gld. Orcas Island, very common on stones and other shells.

Crepidula dorsata Brod. Orcas Island.

Crepidula grandis Midd. Port Graham.

Crepidula navicelloides Nutt. Orcas Island.

Trichotropis cancellata Hds. Orcas Island, common.

Tachyrynchus lacteola Cpr. (*Mesalia lacteola* Cpr.). Dredged and on shore Orcas Island.

Caecum hemphilli Stearns. Ellamar.

Eulima micans Cpr. Orcas Island.

Turbonilla (*Pyrgolampros*) *alaskana* Dall. Orcas Island.

Turbonilla (*Pyrgolampros*) *taylori* D. & B. Ballard Beach.

(*To be continued.*)

ON *OPEAS GOODALLI* MILLER.

BY H. A. PILSBRY.

The species commonly called *Opeas goodalli* is the most slender and acuminate of the American *Opeas*. Its history has been given in detail in the *Manual of Conchology*, XVIII, pp. 200-203 (1906), but in common with other authors I overlooked the fact that the name was preoccupied. The species will henceforth be known as *Opeas pumilum* (Pfr.). The references may be found in full in the *Manual*, but the following synopsis of synonyms may be useful :

Helix goodalli Miller, 1822, not *Helix goodalli* Ferussac, 1821, see Man. Conch., XIX, p. 295.

Bulimus clavulus Turton, 1831, not *Bulimus clavulus* Lamarck, 1822.

Bulimus pumilus Pfr., 1840.

NEW SHELLS FROM THE GULF OF CALIFORNIA.

BY WILLIAM HEALEY DALL.

In sorting and labeling a lot of shells dredged in the Gulf of California near La Paz, in 10-30 fathoms, sandy bottom, the following species were discovered and appear to be undescribed :

Hindsia perideris n. sp.

Shell of about ten whorls, the nucleus smooth white of about two whorls, the subsequent whorls (except the last) slowly enlarging, forming a slender acute spire, the last whorl suddenly larger; sculpture of about six slightly protractive axial ribs, strong and rounded, following each other up the spire in a gently receding spiral, with much wider interspaces, most prominent at the periphery of the whorls, but traceable to the canal; these are crossed between the sutures by six rounded, subequally spaced spiral threads with much wider interspaces (the space between the posterior thread and the suture widest of all), a little swollen where they override the ribs; on the last whorl finer intercalary threads appear, and on the canal are seven or eight stronger, spirally striated cords; aperture subcircular, not lirate within, with a produced, simple peritreme, and behind it a wide, strong, rounded varix over-ridden by the spiral sculpture; canal short, closed when adult, pointed and strongly recurved. The color of the shell is mostly yellowish-white, with a basal and sometimes a sutural brownish spiral band, which shows more or less in the interior of the aperture.

Length of shell 28.5; of last whorl 18; of aperture 5.6; max. diameter of last whorl exclusive of the varix 12.0; including the varix 15.0 mm.

Type U. S. N. Mus., 96658, from 21 fathoms, others from 27 fathoms.

This shell has much resemblance to *Hindsia acuminata* Rve., the

type of the genus, but has a more elevated and slender spire and fewer axial ribs. *H. acuminata* is a Philippine shell.

The genus *Nassaria* of Link was heterogeneous; no type was named. *N. lyrata* Gmelin (S. N., 3494, no. 109) is to my mind quite a different thing from the *Hindsia* of Arthur Adams, based on such species as *H. acuminata*. The former is a reticulate shell without varices, and with an open canal. The latter and its congeners have a strong and prominent terminal varix, a closed canal, when adult, and sculpture more like the *Tritons*. For this reason I propose to revive *Hindsia* for the group to which the name was originally given, although Adams himself later united them.

Cymatium adairense n. sp.

Shell small, with four glassy, smooth nepionic whorls and four and a half subsequent whorls; color of the shell pale brownish, somewhat darker on the prominences; sculpture of about two varices to a whorl, less on the earlier whorls; on the last two whorls the lines joining the varices are nearly at right angles to each other; the portion of the whorls behind the periphery is flattened, thus making the periphery very prominent; upon it between each pair of varices are three prominent nodules; at the corresponding point on the varices is a conspicuous angle, almost a spine, but the remainder of the varical edge is rounded or crenate by the spiral sculpture; the only other axial sculpture is the sharp sulci which cut the spirals; these spirals are numerous, close set, flat, strap-like cords, separated by narrower, sharp grooves and crossed by many subequally spaced sharp axial sulci; these cut the flat surface of the spirals into minute scale-like segments, but where the spirals cross the varices the interspaces widen; canal rather long, recurved, open; aperture rounded, with a nearly entire, projecting peritreme, smooth on the inner lip, with four or five shallow grooves on the inside of the outer lip. Length of shell 33.0; of last whorl 24.0; of aperture 8.0; maximum diameter of last whorl 17.0 mm.

Type, U. S. N. Mus., 214103, from 10 fathoms sand, off Adair Bay; an immature specimen in 10 fathoms off La Paz. The latter had the nepionic shell in perfect condition; it comprises over four whorls with a heavy brown periostracum, which bears three spiral lines from which project very minute tufts of short, hair-like processes.

The species which most nearly recalls this is the *C. gibbosum*

Broderip, which is a much heavier, larger, proportionately wider and more clumsy shell.

Solariella triplostephanus n. sp.

Shell trochiform, with six tabulate whorls; nucleus very minute, glassy, slightly tilted; subsequent whorls flat above, with closely appressed suture; three strong spirals girdle the whorls; one at the shoulder strongly beaded; one at the middle of the whorl minutely undulate, and the third at the suture, simple, and obscured on all the whorls but the last by the suture being laid against it; on the last whorl there may be a few microscopic spiral threadlets between the shoulder and the median spiral; between the anterior spiral and the edge of the umbilicus on the base are six or eight fine-channeled spiral grooves; the cord bordering the funicular umbilicus is coarsely beaded; within the umbilicus are three or more similar but smaller beaded threads; axial sculpture consisting of fine, sharp, uniform and closely set elevated lines corresponding with the lines of growth, but frequently more or less obsolete; aperture nearly circular, oblique, with simple edges, hardly interrupted on the body; throat pearly. Height of shell 5.25; of aperture 2.5; maximum diameter of shell 7.0 mm.

Type, U. S. N. Mus., 97001, in 12 fathoms sand.

The colors of this pretty little shell are yellowish-white, with flames, dots or blotches of lilac or purple-brown.

TWO NEW MEXICAN LANDSHELLS.

BY WILLIAM H. DALL.

During a recent journey in Mexico Mr. Charles R. Orcutt collected at some hot springs near the Rio Verde, Oaxaca, a number of land shells, which he submitted to me for determination. Two of them appear to be new, and the descriptions follows:

Eucalodium (Anisospira) orcutti n. sp.

Shell subcylindrical after decollation, of a pale cinnamon brown, weathering to ashy, with 22 whorls, of which about nine are permanent; apical portion flattened above and with three swollen whorls, the nucleus of about $\frac{3}{4}$ of a whorl smooth gradually becoming ribbed with small low clear-cut, nearly straight riblets separated

by wider interspaces, finely spirally striated; after the first three whorls the riblets become closer and slightly arcuately retractive. and the spiral striation obsolete, while the spire is moderately constricted in front of the swollen apical whorls, gradually increases toward the tenth where it rapidly enlarges its diameter; the last two whorls diminish slightly, the base has no carina, but an almost imperceptible thread continues the sutural line, but does not angulate the almost circular aperture. The lip is slightly expanded and thickened, not produced, and with the throat has a light brownish white color. No lamella is visible in the aperture, but at the back of the last whorl a sharp almost vertical plait surrounds the twisted slender axis, and, in the penultimate whorl only, expands to a flat horizontal lamella, while the twist of the pillar assumes the appearance (for about one whorl) of a spiral cord; the rest of the axis shows only a faint twist, and is very slender, though when broken the section reveals a minute perforation. Two extreme specimens measure:

<i>No Whorls.</i>		<i>Millimeters.</i>		
Adult.	Apical.	Length.	Max. diameter.	Aperture diam.
10		41.5	12.0	8.0
	13	20.0	6.5	
8.5		39.0	14.0	9.5
	13	20.5	7.5	

U. S. Nat. Mus., No. 212319. Also Orcutt collection.

The shell is about one-third larger than *E. (A.) hyalina* Pfr., from the same region; its anterior axial lamella is wider and flatter than that of *E. (A.) liebmanni*; *E. (A.) townsendi* Pilsbry and Cockerill, is of similar shape, but thinner, and has a much longer lamella.

Epiphragmophora (Trichodiscina) verdensis n. sp.

Shell of five whorls, whitish, with a brownish, minutely, irregularly, obliquely tufted periostracum; spire depressed with a deep suture and a rounded peripheral keel near the posterior third of the whorl with a marked compression behind it; nucleus small, minutely pustulate, the pustules being modified as the shell grows, into short elevated ridges along the lines of growth, which bear the tufts of the periostracum; beside this the entire shell is minutely punctate; the

base is conically arched toward the margin of the deep umbilicus; the whorl near the aperture is bent down and the plane of the aperture forms an angle of about 45° with the axis; the whorl is slightly contracted behind the thin expanded margin of the aperture, which is continuous in the adult across the body whorl and slightly overshadows the umbilicus; the lip is whitish. Extremes measure:

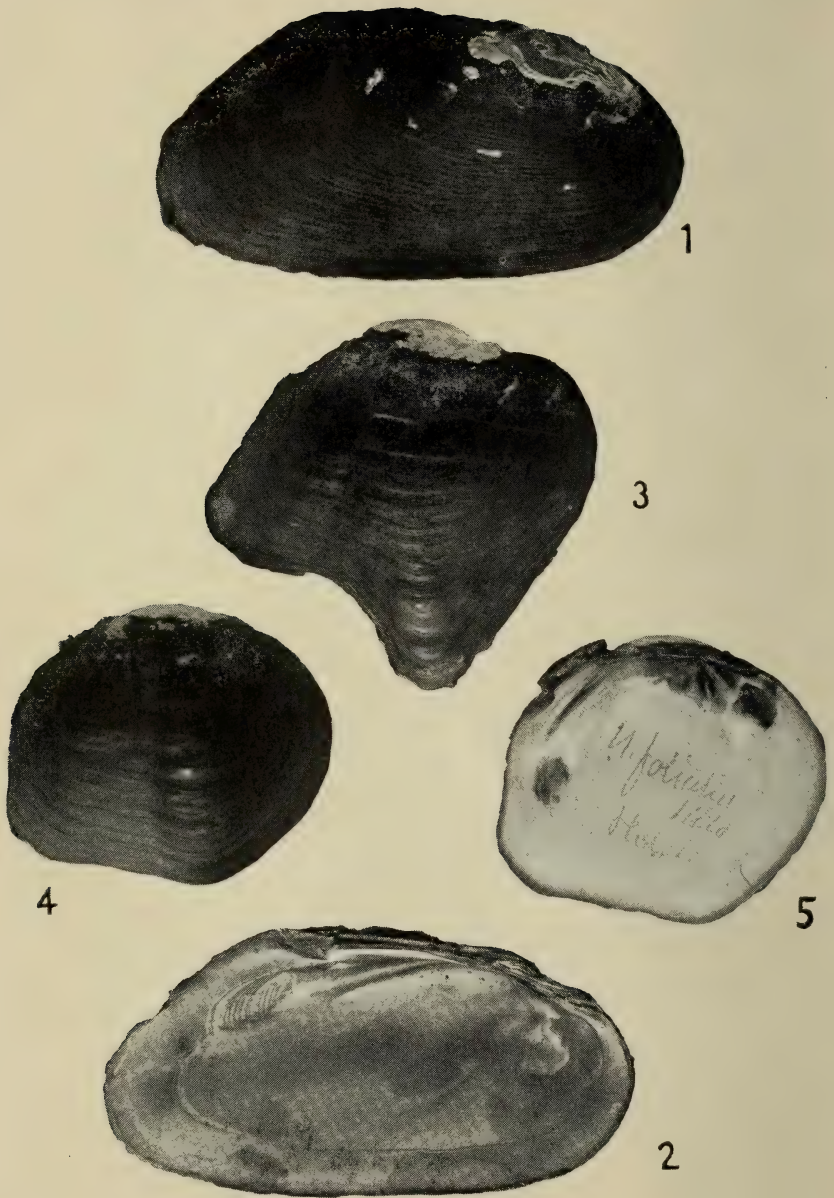
Max. diam. of shell;	of aperture;	height;
15.0	9.0	8.0
16.5	8.5	7.7

U. S. Nat. Mus., No. 212318. Also Orcutt collection.

This is very distinct from the other species of the *Trichodiscina* group.

PUBLICATIONS RECEIVED.

NOTES ON THE GENERA CYPRÆA AND TRIVIA. By H. O. N. SHAW. (Proc. Mal. Soc., London, VIII, 288, 1909.)—An interesting paper treating on the nomenclature and anatomical differences between *Cypræa* and *Trivia*. The latter has a more specialized nervous system and distinct radula. The following are some of the changes in nomenclature which have been considered: *Cypræa intermedia* becomes a synonym of *gillei* Jouss. *C. reticulata*, *histrio* and *eglantina* are also considered varieties of *C. arabica*. *Cypræa bicolor*, *comptonii*, *declivis* and *piperata* are considered only variations of *C. angustata*. *C. cruenta* Gmel. is not the *cruenta* Auctorum, but equals *errones* L.; under these circumstances he adopts the name of *variolaria* Lam. For the recent *C. physis* the original name of *C. achatidea* Sowb. is adopted. For *C. punctulata* Gray, not Gmelin, the name of *robertsi* Hildago must be accepted. The name of *C. friendii* Gray has priority over *scottii* Gask. *C. tubescens* is only a synonym of *teres*. *C. ursellus* Auctorum, not Gmelin, = *C. Melvilli* Hildago. *C. pantherina* Dillw., 1817, becomes a variety of *obtusata* Perry, 1811. *C. prestoni* is proposed for *interrupta* Gray, not Bolten. *C. hidalgoi* for *leucostoma* Gask., not Gmel. *C. gumbiensis* for *nebulosa* Kiener, not Gmel. *Trivia edgari* is proposed for *T. grando* Gask, not Potiez. For *T. oniscus* Lam., not Bolten, the name of *T. aperta* Swains must be retained. Four new varieties are described: *Cypræa helvola* var. *callista*, *C. moneta* var. *aurea*, *C. arabica* var. *prasina*, and *Trivia ovulata* var. *rubra*.—C. W. J.



WALKER: NEW SPATHA AND TRUNCILLA.

THE NAUTILUS.

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No. 4

PURPURA CRISPATA AND SAXICOLA.

BY E. G. VANATTA.

In the following notes I follow Dr. W. H. Dall in using the generic term *Thais* in place of the familiar name *Purpura*.

THAIS PLICATA Mart.

The species usually called *Purpura crispata* from the west coast of America was first named *Buccinum plicatum* Martyn 1789. The figures in Martyn's Univ. Conchology, pl. 44, represent the *large foliated form*, one being brown with white shoulder, and the other all brown. *Buccinum lamellosum* Gmel. 1790, and *Buccinum compositum* (Chem.) Desh. 1843, were based on the same figures or copies of them. *Polyplex rugosus* Perry 1811, is also the brown form with white shoulder. *Buccinum crispatum* Dillw. 1817, and *Murex ferrugineus* Esch. 1829, are *entirely brown*. *Murex lactuca* Esch. 1829 (not Bolt.), is the *white* form of this species.

T. p. VAR. SEPTENTRIONALIS Rve., Conch. Icon. (*Purpura*) III, pl. 10, f. 50, is a name for the rather high spired forms without the longitudinal foliation.

THAIS LIMA Mart. 1789.

Buccinum lima Martyn, Univ. Conch., pl. 46, has many spiral costæ. It has the following synonyms: *Purpura canaliculata* Desh. 1839, *Purpura attenuata* Rve. 1846, *Purpura decemcostata* Midd. 1849, *Purpura analoga* Fbs. 1850 and *Purpura beringiana* Midd. 1851; the latter name is for specimens with the costæ more spaced.

THAIS EMARGINATA Desh. 1839.

Purpura emarginata Desh. Rev. Zool. 1839, p. 360, has usually

been called *Purpura saxicola* Val. which is based on figure 4 of plate 8, Voyage of Venus, 1846, which seems to represent *Purpura freycinetii* Desh. 1839 (from Japan). The name *Purpura emarginata* Desh. 1839, is based on the *short spired rather rough surfaced* form of this species. *Purpura conradi* Nutt. (MSS.), Smiths. Misc. X, pl. 83, Tryon, Manual Conch. II, p. 175, seems to be this form, from specimens received from Mr. Nuttall. *Purpura fuscata* Forbes 1850, applies to the specimens with rather *high spire* and many *spiral costæ*, while *Purpura ostrina* Gld. 1852, is the small, *short spired, smooth* form.

Mr. J. G. Malone, of Portland, Oregon, having presented the Academy of Natural Sciences of Philadelphia with a set of these west coast shells, the preceding revision of the nomenclature was undertaken.

A NEW SPATHA.

BRYANT WALKER.

Spatha kamerunensis, n. sp. Pl. III, figs. 1 and 2.

Shell oblong-ovate, somewhat inflated, subsolid; beaks eroded, but apparently only slightly elevated, sculpture not observed, placed about $\frac{1}{5}$ of the total length from the anterior end: anterior end regularly rounded; basal and dorsal lines nearly parallel, slightly diverging posteriorly; basal line nearly straight, in some specimens slightly arcuate; dorsal line straight or slightly curved; dorsal slope oblique; posterior end somewhat prolonged and regularly rounded; posterior ridge rounded, exhibiting in some specimens, a subobsolete angle, terminating at the lower end of the dorsal slope; dorsal slope sculptured with fine, radiating ridges, curving upwards towards the hinge; surface of the disk subsulcate with strong lines of growth, cut by very fine, impressed, radiating lines, between which the epidermis is minutely and irregularly wrinkled or festooned; epidermis very dark brown, almost black towards the margins; hinge edentulous; beak cavity shallow, with a single, deep, dorsal cicatrix directly under the beak; at the posterior end of the ligament, there is a triangular notch in the dorsal border of the nacreous area; impressions of the adductor muscles large, well marked, irregularly oval; that of protractor pedis reniform, situated slightly behind and at the base of that of the anterior adductor; posterior adductor impression large,

oval; that of the posterior retractor small, elongated-oval, separate from that of the posterior adductor and situated immediately below the notch at the end of the ligament; nacre dark, dull plumbeous, tinged with green, more intense towards the beak cavity; scarcely iridescent posteriorly.

Length (of type) 69; height $35\frac{1}{2}$; diam. 22 mm.

Types (No. 30902 Coll. Walker) from the Kribi River, 17 miles from Efulen, Kamerun. Cotypes in the collections of the Univ. of Mich., the Philadelphia Academy, the Carnegie Museum, and Dr. Louis Germain of Paris, France.

Ten specimens, in alcohol, of this very distinct species were sent by Mr. George Schwab to the museum of the Univ. of Mich., to whose curator, Dr. A. G. Ruthven, I am indebted for specimens for description.

By reason of its sculptured surface, it evidently belongs to the subgenus *Aspatharia* Bgt., as recognized by Simpson (1900) and Germain (1909).

In size, shape and in the peculiar sculpturing of the surface, which requires the use of a lens to develop the detail, it is easily distinguishable from both of the allied species.

Fearing that it might be included among the many new species recently discovered by the French naturalists, I submitted a specimen to Dr. Louis Germain of the Museum of Paris, the well-known expert on African Naiades, and am assured by him that it is entirely distinct from any of the described species.

Dr. A. E. Ortmann of the Carnegie Museum, who is making a special study of the anatomy of the Naiades, has kindly prepared the accompanying description of the soft parts.

THE SOFT PARTS OF SPATHA KAMERUNENSIS WALKER.

BY DR. A. E. ORTMANN.

I am obliged to Mr. Bryant Walker for sending me a complete specimen of the new species of *Spatha*, and the soft parts of two others, for examination. The specimen with shell proved to be a male; one of the other two was a sterile female, while in the third the gills were in too poor condition (crushed and torn), so that no attempt was made to ascertain the sex.

The following are the essential characters of the anatomy.

Anal opening closed above by the union of the inner edges of the mantle, *without leaving a supraanal opening*. The upper, closed portion is rather long, over $1\frac{1}{2}$ times as long as the anal opening. The latter is rather large, about as large as the branchial opening, *separated from the branchial opening by the solid union of the inner mantle edges*. Inner mantle edge of anal opening smooth, that of the branchial opening with rather small papillæ. In front of the branchial opening, the inner mantle edges are unconnected and smooth.

Palpi longer than wide, with curved lower edge, posteriorly with a short truncation, but *not produced into a point*, and not connected.

Gills long and narrow, the inner the wider. Outer gill becoming gradually lower anteriorly, and ending at a point behind and above the posterior end of the palpi (at the highest point of the mantle attachment line). Inner gill hardly lower anteriorly, and *its anterior insertion fills the entire space between the anterior end of the outer gill and the palpi*, so that there is no gap between the posterior end of the inner palpus and the anterior end of the inner gill. Edge of inner gill with a longitudinal furrow, that of the outer gill without this furrow. Outer lamina of outer gill entirely connected with the mantle. Inner lamina of inner gill free from the abdominal sac, except at its anterior end; posteriorly, behind the foot, the two inner laminæ of the inner gills are entirely connected, thus forming the larger anterior part of the diaphragm. All four gills *fall short of the posterior mantle edge, and the posterior continuation of the diaphragm is formed by the bridge uniting the mantle edges*, which, from the mantle edge, extends to a certain distance forward (or inward). This bridge, the mantle part of the diaphragm, is rather short; in the dissected female, the soft parts of which are about 68 mm. long, it is 4 mm. long, while the gill part of the diaphragm is much longer, about 29 mm.

Water tubes of both gills well developed, rather regular and quite distinct from base to edge of gill, but rather wide, and the septa are remote from each other. The latter are heavy and strong; in the male they are similarly developed in both gills, and represent simple lines of union of the tissue of the two laminæ, generally with a large blood vessel in the middle. In the female, the structure of the outer gill is identical with that of the male; but *the inner gill alone is*

marsupial: the septa are more strongly developed, but keep about the same distance from each other as in the male; they are longer in the transversal direction, and possess, at their insertion at the outer lamina of the gill (primary limb) a *marked swelling*, within which generally the blood vessel is located.

The structure of the soft parts of this species of *Spatha* is remarkable for the following *six* particulars.

1. The complete absence of a supraanal opening.
2. The separation of the anal and branchial opening by a bridge formed by the mantle.
3. The contact of the anterior insertion of the inner gill with the posterior insertion of the inner palpus.
4. The absence of a posteriorly produced point of the palpi.
5. The marsupium, which is restricted to the inner gills.
6. The peculiar shape of the septa of the marsupial gill.

Among *North American* shells, I have observed a similar absence of the supraanal opening only in *Lampsilis parva* (Barn.), but this is a secondary modification: is not always present, and all the related forms have such an opening. In *Margaritana* and certain species of *Quadrula* (*Rotundaria*), where a supraanal is also absent, the mantle edges have no tendency to close the anal above, and thus represent another type of structure. With these exceptions, *I have never seen any one of the above characters in any species of North America*. There is always a distinct supraanal opening; the separation of the anal and branchial openings is never formed by the mantle edge, and the diaphragm consists of the gills alone; the anterior insertion of the inner gill is always more or less, generally widely, separated from the posterior insertion of the palpi; the palpi are always drawn out into a posterior, projecting point, and are more or less falcate; and the marsupium is never in the inner gill alone, but either in both gills or in the outer one. As regards the shape of the septa of the marsupial gill, it is unlike anything I have seen in *North American* forms. Unfortunately I cannot tell how far this shape changes in the gravid females, but I think, that the swelling of the gill, when charged, will not be very considerable.

It is clear, that these are very important differences. Simpson (Pr. U. S. Mus. 22, '00, pp. 515 and 895) places *Spatha* in the family *Mutelidæ*, the chief characters of which are the hinge teeth, which, when present, are taxodont, and the shape of the embryo,

which is a lasidium. In *Spatha* there are no, or hardly any, hinge teeth, and they are surely *not* taxodont. The embryo is unknown to me. Yet the above characters of the soft parts fully justify the separation of this genus from the North American *Unionidæ*, and I do not hesitate to affirm, that *Spatha* should stand in a different family, which may be called *Mutelidæ*, if the genus *Mutela* should prove to be allied in the structure of the soft parts. Whether the other genera placed by Simpson in this association actually belong here, remains to be investigated.

DESCRIPTION OF A NEW SPECIES OF TRUNCILLA.

BY BRYANT WALKER.

TRUNCILLA LEWISII n. sp. Pl. III, figs. 3, 4, 5.

Male shell quadrate, subcompressed; thick, solid; dark reddish-yellow, with faint, radiating lines of green; beaks laterally compressed, eroded, but apparently only slightly elevated above the hinge-line, sculpture not seen; anterior end regularly rounded, forming an obtuse angle at its junction with the basal emargination, which is nearly straight; dorsal line curved; posterior end slightly emarginate and terminating in a broad biangulation, which projects slightly beyond the posterior and basal lines; a broad, flat groove extends from the beaks to the basal emargination, widening and deepening as it approaches the base; posterior ridge prominent, rounded towards the beak, but becoming flattened and obsoletely biangulated as it approaches the posterior end; immediately in front of the median groove, there is a strong anterior ridge, which becomes more pronounced as it approaches the base, where it terminates in the angle at the anterior end of the basal emargination, it is more or less roughened by the accentuation of the lines of growth, which elsewhere on the disk are not very strongly developed; dorsal slope concave behind the posterior ridge; interdentum rather long, narrow, rounded and parallel with the hinge; pseudo-cardinals in the left valve, two, the anterior very narrow, straight, directed obliquely forwards and slightly widening towards the anterior end, the posterior triangular, the space between them triangular and extending to the hinge; in the right valve, two, the anterior smaller, but well developed, the posterior long, triangular, the space between them

narrow, direct and extending to the hinge-line, the posterior tooth is separated from the interdentum by a deep groove; lateral teeth bent obliquely downward from the hinge-line, two in the left valve and one in the right, large and nearly straight; anterior adductor impressions large and deep, those of the protractor-pedis well marked, rather long and narrow, below and slightly behind the adductor; anterior retractor impressions small and on the base of the pseudo-cardinal; posterior adductor impressions large, semicircular; those of the posterior retractors small, but well impressed, above that of the adductor and immediately below the end of the lateral tooth; cavity of the beaks shallow; nacre white.

The female shell is thinner than that of the male and proportionately wider, the posterior ridge being more oblique and more extended; the posterior line is straight or slightly curved, without the emargination noted in the male; the anterior ridge is greatly produced beyond the basal line in a triangular prolongation and this, the marsupial expansion, is of a different texture from the rest of the shell, being thin and dark green as in *T. capsæformis*; between this expansion and the posterior ridge, the base is deeply emarginate.

Length (male) 43; height 37; diam. $22\frac{1}{2}$ mm.

Length (female) 51; height $49\frac{1}{2}$; diam. 25 mm.

Types (No. 15612 Coll. Walker), from the Holston River, Tenn. (ex Lewis Coll.). Also from the Clinch River, Tenn. (Lewis); Cumberland River, Port Burnside, Ky. (Wetherby) and the Holston River, Knox Co., Tenn. (Andrews).

This species, while closely related to *T. foliata* Hild., to which it was referred by the original collectors, is clearly distinct. *Foliata* is a much larger and heavier species and is apparently confined to the Ohio and Wabash rivers, while *lewisii* is restricted to the Cumberland and Tennessee drainage systems, and from all the localities given above is remarkably consistent in its peculiar features. Besides being uniformly smaller, more delicate and smoother than *foliata*, it is specially characterized by the difference in the marsupial expansion, which is triangular and comparatively narrow at the extremity and of a different texture from the body of the shell. In *foliata*, this expansion is broadly rounded and is of the same texture as the remainder of the valve.

It is named in memory of the late Dr. James Lewis, of Mohawk, N. Y. (whose collection has furnished the types), who was a con-

chologist far in advance of his contemporaries and through whose endeavors, a very large part of the fauna of Eastern Tennessee was first made known.

SHELL COLLECTING IN PUGET SOUND AND ALASKA.

BY DR. FRED BAKER, SAN DIEGO, CAL.

(*Concluded from p. 31.*)

- Turbonilla (*Strioturbonilla*) *vancouverensis* Baird. Orcas Island.
 Odostomia (*Evalea*) *cookeana* Bartsch. sp. nov. Ellamar.
 Odostomia (*Evalea*) *amchitkana* D. & B. Ellamar.
 Odostomia (*Amaura*) *avellana* Cpr. Shore, Orcas Island.
 Odostomia (*Evalea*) *deliciosa* D. & B. Ballard Beach.
 Odostomia (*Evalea*) *inflata* Cpr. Orcas Island.
 Odostomia (*Evalea*) *valdezi* D. & B. Orcas Island.
 Littorina *groenlandica* Mörch. Seward.
 Littorina *scutulata* Gld. All points visited except Port Graham.
 Littorina *sitchana* Phil. All points visited.
 Lacuna *porrecta* Cpr. Orcas Island, Sucia Island.
 Lacuna *solidula* Lovén. Ellamar.
 Lacuna *vineta* Mtg. Ballard Beach, shore Orcas Island, Ellamar.
 Bittium (*Stylidium*) *eschrichtii* Midd. Dredged and on shore, Orcas Island.
 Alvania *bakeri* Bartsch. sp. nov. Port Graham.
 Onoba *asser* Bartsch. sp. nov. Port Graham.
 Mölleria *quadræ* Dall. Port Graham.
 Calliostoma *annulatum* Mart. Orcas Island, rather common.
 Calliostoma *costatum* Mart. Dredged and on shore Sucia and Orcas Island.
 Calliostoma *variegatum* Cpr. Orcas Island, 4 fine live specimens.
 Margarites *albulus* Gld. Port Graham.
 Margarites *lirulatus* Cpr. Shore, Orcas Island.
 Margarites *pupilla* Gld. Ballard Beach, dredged and on shore, Orcas Island.
 Leptogyra *alaskana* Bartsch. sp. nov. Port Graham.
 Haliotis *kamtschatkana* Jonas. Near Ketchikan, Alaska. (Purchased.)
 Puncturella *cooperi* Cpr. Orcas Island.

Puncturella noachina galeata Gld. Orcas Island.

Acmaea mitra Esch. Port Graham.

Acmaea pelta Esch. Shore Orcas Island, Seward, Ellamar, Port Graham.

Acmaea patina Esch. Ballard Beach, Orcas Island, Ellamar, Seward.

Acmaea patina scutum Esch. Ballard Beach, Orcas Island, Ellamar, Seward.

Cryptobranchia concentrica Midd. Orcas Island, Ellamar, Seward, Port Graham.

Lepidopleurus cancellatus Sby. Port Graham.

Tonicella lineata Wood. Orcas Island, Ballard Beach, Ellamar, Seward.

Tonicella submarmorea Midd. Orcas Island, 1 young specimen.

Ischnochiton interstinctus Gld. Orcas Island.

Ischnochiton mertensii Midd. Orcas Island.

Ischnochiton (Radsia) trifidus Cpr. Orcas Island.

Trachydermon excelsus Gld. Port Graham.

Trachydermon albus Linn. Port Graham.

Trachydermon raymondi Pilsbry. Ellamar; Port Graham.

Mopalia acuta Cpr. Ellamar.

Mopalia ciliata Sby. Orcas Island.

Mopalia muscosa Gld. Ballard Beach.

Mopalia muscosa hindsii Rve. Orcas Island.

Mopalia muscosa lignosa Gld. Orcas Island; Ballard Beach.

Cryptochiton stelleri Midd. Shore Orcas Island.

Tornatina eximia Baird. Orcas Island, a single specimen.

Cylichna alba Brown. Ellamar, a single specimen.

Haminea vesicula? Gld. Shore Orcas Island, a single specimen.

Dentalium rectius Cpr. Orcas Island, taken in only one dredge haul.

Saxicava arctica Linn. Port Graham; Ellamar.

Mya arenaria Linn. Orcas Island, an introduced species.

Mya arenaria alaskana Dall. Orcas Island, a single young specimen; Port Graham, dead.

Mya truncata Linn. Orcas Island, 3 valves.

Cryptomya californica Conr. Ellamar.

Pandora (Kennerlia) filosa Cpr. Orcas Island, not rare.

Pandora (Kennerlia) grandis Dall. Orcas Island, 4 living specimens.

Pandora (*Clidiophora*) *punctata* Cpr. Ellamar, young.

Lyonsia californica Conr. Orcas Island, single valve.

Agriodesma saxicola Baird. Orcas Island.

Mytilimeria nuttalli Conr. Orcas Island, very large specimens in masses of the common Tunicate—*Cynthia haustor*.

Mactra (*Spisula*) *alaskana* Dall. Cordova; Alaska and Ellamar.

Schizothaerus nuttalli Conr. Shore Orcas Island, very large; Ellamar.

Tellina (*Angulus*) *buttoni* Dall. Ballard Beach.

Moerella salmonea Cpr. Ballard Beach.

Macoma balthica Linn. Orcas Island; Ellamar.

Macoma calcarea Gmelin. Orcas Island.

Macoma carlottensis Whiteaves. Ellamar, one young specimen.

Macoma incongrua von Martens. Port Graham.

Macoma inconspicua Brod. & Sby. Orcas Island; Ballard Beach; Ellamar.

Macoma inflatula Dall. Orcas Island.

Macoma inquinata Cpr. Orcas Island; Sucia Island; Ellamar.

Macoma leptonoidea Dall. Orcas Island.

Macoma nasuta Conr. Ballard Beach; Shore Orcas Island, very common.

Macoma secta Conr. Ballard Beach.

Saxidomus giganteus Desh. Ballard Beach, shore and dredged; Orcas Island; Ellamar; Port Graham.

Marcia kennerleyi Rve. Orcas Island.

Marcia (*Venerella*) *subdiaphana* Cpr. Orcas Island.

Psephidia lordi Baird. Orcas Island; Ellamar.

Paphia (*Protothaca*) *staminea* Conr. and varieties. Orcas Island; Sucia Island; Ellamar.

Pisidium occidentale Bourg.? In bogs at an elevation of about 1000 feet on Mt. Constitution, Orcas Island.

Cardium (*Cerastoderma*) *californiense* Desh. Orcas Island.

Cardium (*Cerastoderma*) *corbis* Mart. All points visited.

Serripes groenlandicus Gmel. Orcas Island.

Phacoides tenuisculptus Conr. Orcas Island.

Axinopsis sericata Cpr. Orcas Island; Ellamar.

Erycina compressa Dall. Ellamar, dead on shore.

Erycina rugifera Cpr. Orcas Island. All specimens taken were attached to the ventral surface of the so-called Sea Mouse, *Aphro-*

dita. It has been reported as growing on *Gebia pugetensis*, a burrowing crustacean, but so far as I know, no report has been made of this habitat. About a quarter of the specimens taken had one or more of the mollusks attached.

- Lepton meröeum* Cpr. Orcas Island.
Kellia laperousii Desh. Orcas Island, Ellamar.
Kellia suborbicularis Montagu. Ellamar.
Rochefortia aleutica Dall. Port Graham.
Rochefortia tumida Cpr. Ballard Beach.
Turtonia minuta Mont. Ellamar, Port Graham.
Astarte alaskensis Dall. Orcas Island.
Astarte rollandi Bernardi. Port Graham, very common.
Venericardia ventricosa Gld. Orcas Island.
Nucula belloti A. Ad. Orcas Island.
Yoldia ensifera Dall. Orcas Island.
Yoldia limatula Say. Orcas Island.
Yoldia thraciæformis Storer. Orcas Island.
Glycimeris subobsoleta Cpr. Orcas Island.
Mytilus edulis Linn. All points visited.
Modiolus capax Conr. Orcas Island.
Modiolus fornicatus Cpr. Orcas Island.
Modiolus modiolus Linn. Shore Orcas Island, Port Graham.
Modiolaria laevigata Gray. Orcas Island.
Modiolaria vernicosa Midd. Ellamar.
Pecten (*Patinopecten*) *caurinus* Gld. Orcas Island, 8 living and several valves.
Pecten (*Chlamys*) *hastatus* Sby. Orcas Island.
Pecten (*Chlamys*) *hastatus hericus* Gld. Orcas Island.
Pecten (*Chlamys*) *hastatus hindsii* Cpr. Orcas Island.
Pecten (*Chlamys*) *hastatus navarchus* Dall. Orcas Island.
Monia macrochisma Desh. Orcas Island.
Terebratalia transversa Sby. Orcas Island.

NOTES ON DAVISIA AND MALVINASIA.

BY WM. H. DALL.

In the *Annals and Magazine of Natural History* for January, 1910, Messrs. J. E. Cooper and H. B. Preston described two supposedly new genera of minute bivalves from the Falkland Islands. Through

the courtesy of Mr. Preston and the great kindness of M. Philippe Dautzenberg of Paris, who had purchased the types of these genera, I have been able to examine them under the compound microscope and determine their hinge characters. These very minute bivalves are exceedingly difficult objects of study, and unless one is familiar with the type of hinge possessed by them it is very difficult to determine their true characters.

I find *Davisia* to possess exactly the type of hinge figured by Bernard for "*Erycina*" *veneris* Mun. Chalmas and Velain, in Bull. Mus. d'hist. Nat. de Paris, 1898, p. 81, fig. 3. This is not an *Erycina* in the proper sense, as Bernard points out, but is very closely related to *Kellia* as typified by *K. suborbicularis*. If examination of other species should show that the small differences which exist are constant, the group might rank as a section of *Kellia*.

Malvinasia on the other hand is based on a normal species of *Rocheffortia* (see Bernard, *op. cit.*, p. 82, fig. 4).

I may in this connection recall that another supposed new genus of Leptonacea, *Diplodontina* Stempell, 1899, from Chile, has the hinge of *Kellia* and is probably a member of the latter genus.

NOTES.

SHALL WE BE ORDERED OFF THE BEACHES?—There already exists a trust or combination which controls the trade in food fishes, and I suspect that there are those who would like to extend the same system to the mollusks. At least I have just seen a book called "Shell-fish Industries," by Prof. James L. Kellogg, which, mingling data about edible mollusks with some ordinary politicians' talk or "buncombe" about the superiority of American to European institutions and the like, appears to be put out to promote the passing of laws which would facilitate the monopolization of our mollusks. It recommends handing over our beaches and mud-flats to private landlords or sealords. Most shell collectors have been annoyed by attempts to exclude them, by means sometimes legal sometimes illegal and fraudulent, from access to sea, rivers or lakes, and will not be pleased to find a professed naturalist working to deprive them of any right to collect marine mollusks except in deep water with a dredge. For example, while collecting at Nahant, Massachusetts, between tides, I have been told to get out by a minion of an adjacent landowner, notwithstanding that I had a legal right to be there, although I would no longer have it under the laws proposed by this book.—JOHN A. ALLEN.

THE NAUTILUS.

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No. 5

SOME NOTES ON THE OLIVIDAE.

BY CHARLES W. JOHNSON.

I.

Perhaps no group of shells presents such a great variation of color as occurs in many species of the genus *Oliva*. In trying to define the true relative position of the various forms, two conditions act as impediments—the confusion in nomenclature and the lack of positive localities for the species. Localities for species are frequently cited which are undoubtedly erroneous. That many of the forms represent only local races is apparent from the fact that where specimens have a positive habitat within the range of a species, there is as a rule an apparent uniformity of the specimens which readily distinguishes them from others. This can perhaps be reasonably accounted for when we take into consideration their distribution and habits. Chiefly tropical and living on the sandy shores and bars of the more sheltered and shallow waters of the gulfs and bays, their distribution is necessarily restricted, thus creating environmental conditions, favorable for numerous local variations. The necessity for studying the species faunologically is therefore evident, and if monographers had done so, a much clearer idea of the relationship of species and the range of specific variation would have been attained.

Tryon's views as to synonymy are most excellent, the chief fault of his work being his disregard of priority, even of the Lamarckian species. The excellent and numerous figures by Marrat (*Sowerby's Thesaurus Conchyliorum*, vol. iv) illustrate practically all important

variations, which was the author's intention rather than to define the species, although many of these are treated as species. His species credited to Martini and Meuschen will have to be ignored, but those of Bolten will stand.

I have been led to write these notes in connection with my attempt to list the collection of the late John Ford. In making comparative studies I have also used the collection of the Boston Society of Natural History, thus having large series of all the more variable species. With the combined collections, I have before me over 250 specimens referable to the following species and varieties.

OLIVA SERICEA (Bolten).

Porphyria sericea Bolten, Mus. Boltenianum, p. 33, 1798.

Oliva textilina Lam., Ann. du Mus., p. 309, 1810. Bolton's and Lamarck's species are both based upon the same recognizable figure by Martini (Conch. Cab. II, tab. 51, fig. 559). Bolton's being the first name proposed will have to be adopted, as was done by Marrat. Why Tryon should have chosen the doubtful *irisans* described on page 310 instead of *textilina* on page 309, making the latter a variety of the former is hard to understand. Lamarck's first figure referring to *irisans* is that of Martini (Conch. Cab., fig. 561). He again refers to the same figure under *reticularis* (Ann. du Mus., xvi, p. 314). Bolten refers to the same figure (561) as a second example of *sericea*, evidently considering it the young of that species. One feels doubtful as to the identity of this figure; unbiased I should have referred it to a light-colored *sanguinolenta*. The second figures referred to by Lamarck are those given by Chemnitz (Conch. Cab., x, tab. 147, figs. 1371, 1372). This reference is followed by a question mark. The latter figures certainly do not belong to this variable species, but possibly to a form of *elegans*. Both Weinkauff and Marrat seem to have selected the callous spired forms of *zeilanica* as the representative of Lamarck's *irisans*. As the callus spire is not mentioned in the original description or shown in the figures referred to, they are evidently in error, as was pointed out by Ford when describing *cryptospira* (Proc. Acad. Nat. Sci., 1891, p. 98).

It is probable that the progenitor of all the forms of this variable species is *tremulina* from which diverge three well-marked varieties with a number of parallel variations connected by intermediate forms, but the rules of priority compel the adoption of one of the extreme variations.

Variety *tremulina* Lamarck.

Oliva tremulina Lam., Ann. du Mus., XVI, p. 310, 1810.

This is well shown by Marrat on plate 8, fig. 117. It is in every respect like *miniacea* except that the aperture is white or bluish white; *fumosa* Marr. is only a dark form. The var. *pica* Lam. (*nobilis* Reeve + *concinna* Marr.) is more or less coarsely and irregularly marked with dark brown, but forms are before me representing all intermediate stages between *tremulina* and the var. *tenebrosa* Marr. in which the dark brown covers the entire shell.

Variety *miniacea* (Bolten).

Porphyria miniacea Bolten, Mus. Boltenianum, p. 33, 1798.

Oliva erythrostoma Lam., Ann. du Mus., XVI, p. 309, 1810.

Both authors again refer to the same figures by Martini (Conch. Cab., II, tab. 45, figs. 476, 477). Distinguished from *tremulina* in having the aperture a bright orange red. Intermediate forms connect it with a uniform dark brown form similar to *tenebrosa*, see Thes. Conch., IV, pl. 7, fig. 109 (var. *marrati* n. var.). On the other hand the shells become gradually lighter in color and abnormally thickened, representing the var. *ponderosa* Duclos. The latter seems to be the characteristic form of Mauritius and adjacent islands.

Variety *zeilanica* Lamarck.

Oliva zeilanica Lam., Anim. sans Vert.; VII, p. 436, 1822.

This represents a smaller race quite readily separated in the adult but completely connected with *tremulina* in younger specimens. In other words it does not go beyond this juvenile appearance even in the adult. This view is strengthened by the fact that it also shows a parallel variation in color. There is however a variation which is apparently peculiar to this race, which consists of the spire in the adult becoming covered by a callus. Three specimens that would otherwise be typical *zeilanica* show this feature. This gradually merges into a lighter colored form, often with a violet-colored aperture constituting the var. *ornata* Marr. A light yellow form with only a slight trace of the markings constitutes the var. *cryptospira* Ford, which merges into a dark brown form resembling *tenebrosa*, see Thes. Conch., IV, pl. 9, fig. 126 (var. *fordi* n. var.). These varietal names are given merely for convenience in referring to these extreme forms.

SOME NOTES ON PYRAMIDELLID NOMENCLATURE.

BY TOM IREDALE.

The study of Pyramidellid Mollusks is attended with great difficulty, and systematic treatment of the family has not been attempted within recent years until the investigation of American forms was undertaken by Messrs. Dall and Bartsch. Great praise is due to their efforts which have been crowned by the publication of a Synopsis of the Genera, Subgenera and Sections of the family Pyramidellidæ. This is included in their Monograph of West American Pyramidellid Mollusks (Bull. U. S. Nat. Mus., No. 68, 1909) and inasmuch as the preface includes the remark "In all cases the synonymy of group names adopted has been based on researches which began with the typical species of the original authors," one would expect exact quotations. It is deeply to be regretted that in the preparation of the Synopsis due care was not given to the verification of the introduction of the divisional names chosen. As a consequence errors have been perpetuated and workers in remote localities will now further add confusion. To such, on account of lack of literature, are denied the means of verification, and the data provided by Messrs. Dall and Bartsch will be copied without criticism. The practical value of the work done by Messrs. Dall and Bartsch is immense, and there can be no doubt that their conclusions will in the main be unquestionably accepted. It is much against my will that I should have to point out blemishes regarding their quotations of literature. However it is only by means of criticism that we can hope to attain completeness, and I herewith indicate a few errors in the hope that when the East American Pyramidellid mollusks are monographed a revised and corrected Synopsis will be included. All the references to Dall and Bartsch in the succeeding notes are to the paper above mentioned.

ACTÆOPYRAMIS Fischer.

On p. 17—*Monotygmæ* Gray. Syn. Brit. Mus., 1840. I note this only to point out that in the Synopsis of the British Museum, 1840 and 1842, lists of nude generic names are given by Gray, and though often quoted these have no scientific value as of that place. No indication whatever appears as to species.

EULIMELLA.

Dall and Bartsch, on p. 10, write

Subgenus *Eulimella* Forbes, 1846 (6).

Type, *Eulimella crassula* Forbes = *E. scillæ* Scacchi.

On p. 17 is found the familiar quotation

(6) *Eulimella* Forbes, Ann. Mag. Nat. Hist., Vol. 14, 1846, p. 412. This reference appears to have been introduced into literature by Hermannsen; copied by Scudder it has attained a wide acceptance, two recent users I have noted being Locard (Cat. Moll. Viv. France, 1886, p. 211) and Kobelt (Icon. Schale. Europ. Meeres conchy. Vol. III, p. 161, 1903). Yet two errors appear in it: Vol. 14 was issued in 1844 and there the genus is not introduced; a shell, *Eulima MacAndrei* is described on p. 412 by Forbes.

The first introduction of *Eulimella* is, as given by Marschall, in the Ann. Mag. Nat. Hist., Vol. XIX, p. 311, 1847, where Jeffreys writes "*Eulimella* (Forbes) *crassula* Mal. and Conch. J. *E. MacAndrei* Forbes."

The incomplete quotation should read "Mal. and Conch. Mag. pl. I, p. 34, 1838," where Jeffreys listed *Eulima crassula* n. sp. No description was offered and its assignment to Forbes by Dall and Bartsch is incorrect.

In the P. Z. S., 1847, p. 160, Gray wrote

"*Eulimella* Forbes, 1846. . . . *Melania scillæ*. This notice appears to conform with the scant regulation now considered sufficient to carry a generic name so that it would appear that we must quote this genus as of Gray. It may be argued that Jeffreys has precedence and it seems doubtful to me to whom should be given the credit. I prefer Gray's quotation. I have searched throughout Forbes' papers from 1844 to 1847 and have been unable to meet with the name. I conclude it was a MS. name, and in support of this view would cite the Hist. Brit. Moll., p. 308, 1850. There the genus is assigned to Forbes; it is well described, and though full references are appended no notice of the previous occurrence in literature of *Eulimella* is given save the one by Jeffreys. Dall and Bartsch give as a synonym of *Eulimella*, *Loxoptyxis* Cossmann; the paper they quote was included in the Ann. Soc. Roy. Malac. Belg., Vol. XXIII, for the year 1888, p. 99. What year the Annales appeared in I cannot say, but I noticed that on the title page of those for 1896 is printed "Distribué le 24 décembre 1899."

As synonymous also is regarded *Belonidium* Cossmann, Jour. de Conch., Vol. 40, 1892, p. 350. This name appears to have been

overlooked by the compilers of the Zool. Record; it is as well to note that the part of the Jour. de Conch. containing this name was not received at the British Museum until the 10th of May, 1893, as noted in the Jour. Malac., Vol. 3, p. 9, 1894. As type of this genus Dall and Bartsch write "*Aciculina gracilis* Cossmann." Should it not be "*Aciculina gracilis* Deshayes"?

OSCILLA.

On p. 17 Dall and Bartsch include this in the synonymy of *Cingulina*; their reference reads "*Oscilla* A. Adams, Idem, 1860, p. 418; type, *Oscilla lirata* A. Adams;" the Idem stands for Ann. Mag. Nat. Hist., 3d Ser., Vol. 6. But at that place *Oscilla* does not occur.

Oscilla is defined in the Proc. Zool. Soc., 1867, p. 310, where five species are included; the first species is *lirata* A. Adams, but the third is *cingulata* A. Ad., which when it was introduced as *Monoptygma cingulata* in the Ann. Mag. Nat. Hist. Ser., III, Vol. VII, p. 296, 1861, was followed by this note. "This species is by no means typical, and should form a subgenus under the name of *Oscilla*." Consequently *cingulata* A. Ad. must be regarded as the type of *Oscilla*, and the name date from this introduction. There is a group of Pyramidellid mollusks which agree with *cingulata* and the subgeneric definition "*plica parietali, valida, transversa, mediana*," and though superficially resembling *Cingulina* are shorter, broader shells, and are recognizable as *Odostomias* rather than *Turbonillas*. As I can see no group to which they are otherwise referable, I advise the retention of *Oscilla* for these forms: they compose a group quite as natural as any other Pyramidellid group.

Since this note was written I have seen a paper by Hedley (P. L. S. N. S. W., Vol. XXXIV, 1909), wherein are described *Odostomia gumia*, p. 446, pl. XLI, fig. 67, *Odostomia migma*, p. 447, pl. XLI, fig. 70, and *Odostomia laquearia*, p. 447, pl. XLIII, fig. 82. These beautiful figures indicate shells, which from their form I should class as *Oscilla*. They do not look like *Turbonilla*.

AGATHA.

Dall and Bartsch at the foot of p. 10 write "The status of *Agatha virgo* A. Adams, 1860 (*Menestho*, 1861, *Myonia*, 1861, *Amathis*, 1861), is not known to us. From the meager description we are inclined to believe that it is allied to *Actaeopyramis* Fischer."

But in the Proc. U. S. Nat. Mus., Vol. 30, 1906, p. 335, pl.

XVIII, fig. 2, the same authors had redescribed and figured this shell accepting *Agatha* as a valid subgenus of *Pyramidella*. They gave full references and concluded with "*P. (A.) virgo* A. Ad. is the type of *Agatha*; we do not know why Adams changed this to *Myonia* and *Amathis* as we have been unable to find the name pre-occupied."

The references they give provide the solution of their puzzle. When A. Adams described *Agatha virgo*¹ he did not introduce a new genus, as after the description he wrote "may well be regarded as the queen of a genus of which all the species are lovely." This indicates that a genus with a number of species known to him and already described was in his mind. This is confirmed later by the remark "*Myonia virgo* is a third species of *Menestho*."² These two papers were written from Japan, and immediately upon receipt of the first one he corrected the error thus, "generic name should have been *Myonia* not *Agatha*."³

He then introduced *Amathis*⁴ and designated as type *Myonia virgo* A. Ad. From the preceding it seems that *Amathis* should be utilized, but a puzzling complication is introduced by the fact that later Adams himself forgot his work and reintroducing *Agatha* remarks "of which *A. virgo* A. Ad. is the type."⁵

DE FOLIN'S NAMES.

De Folin introduced many genera of his family *Chemnitzidæ* and these names are noted in Dall and Bartsch's work. The history of these names as well as the interpretation appears very imperfectly known, and it would have been well had Dall and Bartsch gone carefully into the literature. They appear to have handled the conchological work splendidly, and it is disappointing to have to find fault with their quotations. In a series entitled "Les Fonds de la Mer," which was issued in parts from 1867 onwards and is apparently complete in three volumes, De Folin described a number of *Pyramidellids*. New generic names were introduced without indication of their novelty.

At the same time De Folin drew up a classification of the *Chemnitzidæ* which was published in the Ann. Soc. Linn. Maine et Loire, Vol. XII, pp. 191 *et seq.*, 1870. This appears to have escaped Dall

¹ Annals, Ser. III, Vol. VI, 1860, p. 422.

² *Loc. cit.*, Vol. VII, 1861, p. 295.

³ *Loc. cit.*, Vol. VIII, 1861, p. 142.

⁴ *Loc. cit.*, Vol. VIII, 1861, p. 303.

⁵ *Loc. cit.*, Ser. IV, Vol. VI, 1870, p. 127.

and Bartsch's notice. The title of the paper is "D'une Méthode de Classification pour les coquilles de la famille des Chemnitzidæ," and on p. 200 is given a tabular statement of the family where appear the names *Oceanida*, *Salassia*, *Ondina*, *Elodia*, *Odetta* and *Noëmia*. No species are mentioned.

In the Ann. Soc. Agri. et Hist. Nat., Lyons, Vol. VII, 1884 (1885), pp. 209 *et seq.*, De Folin included another paper entitled "Constitution Méthodique rationnelle et naturelle de la Famille des Chemnitzidæ." The tabular statement above mentioned is there reproduced without alteration. A reprint of this paper appears to have been consulted by Dall and Bartsch as they quote it under its title and give pagination agreeing with that conclusion.

I have only had access to the first volume of "Les Fonds de la Mer," which appears to be a scarce work.

In that volume on p. 214 two species are diagnosed as *Ondina sulcata* De Folin and *Jaminea bilirata* De Folin. The part including these names was issued in 1869. On p. 264 *Oceanida graduata* De Folin is introduced. This part appeared in 1870. At the end of this volume on p. 314 a list of new species actually to hand is noted. There is mentioned *Odetta* spp, *Noëmia* spp, *Lia* spp, *Elodia elegans* and *Salassia carinata*. These were probably published in the succeeding volumes. I conclude p. 314 came out in 1871.

With their references to these names Dall and Bartsch have been peculiarly unfortunate, in almost every instance errors having crept in.

First (p. 13) they accept as a valid subgenus "*Elodiamea* De Folin 1884 (26)." Referring to (26) p. 18 we read "*Elodiamea* De Folin, Zool. Record, Vol. 22, 1885, p. 94 = *Elodia* De Folin, Les Méléagriniques, 1867, p. 66; type, *Elodia elegans* De Folin, not *Elodia* Desvoidy, 1863; + *Herviera* Melvill and Standen, Journ. Conch., Vol. 9, 1897, p. 185; type, *Pyrgulina gliriella* Melvill and Standen. The Zool. Record for 1885 would not be published until 1886, so that 1884 is obviously incorrect. *Elodia* is not introduced at the place quoted: a species *Eulima elodia* there appears; if that be the same as *Elodia elegans*, then Dall and Bartsch have produced a second complication as they have re-named *elegans* on account of its preoccupation in *Odostomia*.

The Jour. Conch., Vol. 9, p. 185, appeared in 1899 not 1897, and if *Herviera* be a synonym of *Elodiamea*, then the latter is identical with *Odostomella* Bucquoy Dautz. and Dollf. Hedley (P. L. S. N.

S. W., Vol. XXX, p. 525, 1906) has already suggested the identity of *Herviera* with *Odostomella*. Dall and Bartsch wrongly cite this genus as *Odostomiella* and separate it from *Elodiamea* by characters which seem intangible, as the two species of *Herviera* show features assigned to each.

On p. 134 Dall and Bartsch include as valid *Salassia* De Folin, Const. d. Chemnitzidæ, 1885, p. 15, and then for the type species give the quotation *Salassia carinata* De Folin, Fonds de la Mer, Vol. 2, 1872, p. 168, pl. 6, fig. 6.

This latter would appear to be the quotation for the subgenus. Certainly the former cannot be used as the name appeared under exactly the same conditions in the 1870 paper above noted.

However is not the name preoccupied by *Salassa* Moore, P. Z. S., 1859, p. 246? To divert, on p. 16 is indicated and on p. 133 is diagnosed a new subgenus *Salassiella*. Is not this also preoccupied by *Salassiella* Strebel, Mex. K. Land. u. Suswass. Conch., III, p. 6, 29, 1877?

On p. 16 *Oceanida* De Folin is included as valid and the correct reference is given, but the type species name is misquoted *gradata*; it should be *graduata*. Into synonymy Dall and Bartsch consign the rest of De Folin's genera, *Noëmia*, *Lia*, *Odetta*, *Jaminea*, *Jaminina* and *Ondina*. The first three are all recorded as nude names in Vol. I, p. 314, 1871.

This is quoted for *Noëmia*, p. 136, as Fonds de la Mer, 1873, p. 314.

Lia, p. 176, 1870, p. 515.

Odetta, p. 184, 1870, p. 314.

"*Jaminea* De Folin, Constit. Method. de la Fam. Chemnitzidæ, 1885, p. 15. Type *Jaminea bilirata* De Folin; not *Jaminea* Brown, 1827. + *Jaminina* De Folin, Zool. Record, Vol. 22, 1885, p. 94. Type *Jaminea bilirata* De Folin." This appears in the synonymy of *Menestho* Möller, on p. 184, and seems incorrectly stated. As previously noted *Jaminea bilirata* De Folin was diagnosed in Fonds de la Mer, Vol. I, p. 214, 1869; in the 1885 paper De Folin writes "*Jaminea* Brown," and gives no names of species so that I cannot understand the reason of typifying it as of De Folin. *Jaminina* De Folin does not occur in any copies of the Zool. Record, 1885, p. 94, that I have had access to, and I have been unable to trace it. Of course all the preceding are minute errors but they are, nevertheless, very perplexing if literature is unavailable.

I have noted the following typographical errors :

P. 8, line 22 Scacchi should read Brocchi.

11,	22	<i>plicata</i>	<i>plicatula</i> .
17,	22	1853	1833.
18,	20	p. 59	p. 8.
	30	1879	1899.
29,	3	<i>plicata</i>	<i>plicatula</i> .
	14	<i>plicata</i>	<i>plicatula</i> .
	15	<i>plicatus</i>	<i>plicatulus</i> .

It is interesting to note that these errors are indexed.

On p. 18, line 27 as reference to (41) is given Proc. Royal Soc. Tasmania, 1877, p. 152. The correct quotation is Trans. Roy. Soc., South Australia, Vol. XXIV, p. 98, 1900.

DESCRIPTION OF A NEW LYMNÆA.

BY F. C. BAKER.

LYMNÆA EMARGINATA WISCONSINENSIS nov. var.

Lymnæa ampla Whiteaves (not Mighels), Can. Nat. and Geol., VIII, pp. 102, 112, fig. 11, 1863.—Taylor, Ottawa Nat., VI, p. 35, 1892.

Shell very large, varying from elongate to globose, inflated, usually rather thin; periostracum varying from light yellowish horn to chestnut; nuclear whorls as in *emarginata*; sculpture as in *emarginata*; many specimens have, in addition to the spiral impressed lines, a number of heavy, more or less equidistant, spiral ridges encircling the body whorl; the last whorl may also be somewhat malleated; whorls 5 to $5\frac{1}{2}$; globose, roundly shouldered, inflated, the body whorl very globose and disproportionately swollen; spire varying from broadly acute to flatly depressed, usually about half the length of the entire shell; suture well marked, often deeply impressed; aperture roundly-ovate, rarely quadrate, seldom flaring; peristome with internal, varical thickening; inner lip wide, whitish, broadly reflected over the umbilical region producing a wide, flat expansion, which emarginates the umbilical chink, as in the typical form; umbilical chink usually very large and conspicuous; imperforate individuals are rare; the parietal callus is thick and wide producing a continuous aperture in some specimens; the lower part of the aperture is somewhat effuse in a few individuals.

Length, 23.50; breadth, 15.00; aperture length, 13.00; breadth, 7.50 mill.

Length, 22.00; breadth, 15.00; aperture length, 12.00; breadth, 8.00 mill.

Length, 24.00; breadth, 16.00; aperture length, 13.50; breadth, 9.00 mill.

Length, 24.00; breadth, 16.25; aperture length, 13.00; breadth, 8.00.

Length, 26.50; breadth, 19.50; aperture length, 16.50; breadth, 11.00.

Length, 25.00; breadth, 19.00; aperture length, 16.00; breadth, 10.00 mill.

Length, 36.00; breadth, 19.00; aperture length, 16.50; breadth, 10.00 mill.

Types: The Chicago Academy of Sciences, 19 specimens, no. 24504; cotypes, coll. Bryant Walker, Detroit, Mich., and Academy of Natural Sciences of Philadelphia.

Type locality: East shore Tomahawk Lake, Oneida Co., Wis.

Animal: Similar to typical *emarginata*. The animals of the Tomahawk Lake race are of two very pronounced colors, black with white dots and bright yellow with white dots. This difference in the animal is quite conspicuous rendering the light-colored specimens less noticeable than the dark-colored in individuals against the white sand of the shore.

Jaw, Radula and Genitalia: In all respects similar to those of *emarginata*.

Range: Southern Quebec west to Wisconsin.

L. wisconsinensis has been seen from but two places, Brome Lake, Brome District, Quebec (Whiteaves), and Tomahawk Lake, Oneida Co., Wisconsin (Baker). It doubtless lives in many lakes between these two points, and has probably been identified as *L. mighelsi*.

Ecology: In Tomahawk Lake, Wisconsin, this species is very abundant, the shore after storms being literally paved with dead shells. It lives on the sandy or pebbly shores, in water from a few inches to several feet in depth. By wading along the beach thousands may be collected. The localities in this lake are all on exposed points or in curved bays where the shore receives the full force of the waves. No specimens were found in sheltered places, where the water was at all stagnant. As recorded by Dr. Kirtland, for *angulata*, they were irregularly scattered over the surface, crawling over the sand, where a distinct track was left, or else lying half buried in the sand. The two different colors mentioned by Nylander as being characteristic of the Maine *emarginata* were also observed in the Tomahawk Lake specimens.

Remarks: This race differs from all the other races of *emarginata* in its very globose body whorl and rounded aperture. The race is very variable, the variant being the spire which is elongated or depressed. Some individuals approach *mighelsi*, but this is rare, the shell being usually much more globose than that race. *Angulata* differs in having a heavier shell, a much less globose body whorl, and an elongated and angulated, instead of rounded, aperture. The umbilicus is closed in *angulata* while it is usually open in *wisconsinensis*. The globose form will, however, separate this race from all

others. The umbilical chink is usually conspicuous but may be so wide as to form a deep umbilicus or it may be entirely closed, as in some specimens from both Wisconsin and Canada. *L. e. wisconsinensis* is by far the most abundant shell in Tomahawk Lake, Wisconsin, where, in many places, it forms windrows of dead shells on the shore after a northwesterly storm. It was at first thought to be a variety of the *mighelsi* type of shell, but the globular form of the body whorl is so different from *mighelsi* and the shells are so numerous in the original locality as to render it quite as eligible to receive a name as are any of the races of *Lymnæa*.

NOTES.

THE LAMARCK COLLECTION.—In these days, when systematists pay more attention to ancient authors, it is of the highest importance to know the precise specimens which those authors had before them when they wrote their descriptions, usually almost unintelligible to us, and gave their names. Among the more important systematic works of the early part of the last century is Lamarck's "*Histoire Naturelle des Animaux sans Vertèbres*." Consequently the specimens on which that work was based are of particular value. On Lamarck's death his conchological collection was bought by Prince Masséna. Some years later it became the property of Mr. Benjamin Delessert, who bequeathed it to the city of Geneva, and it is now preserved in the natural history museum of that place. It contained chiefly shells of mollusks and brachiopods, both living and fossil. It was accompanied by a catalogue based on a copy of the "*Histoire Naturelle*," and containing marginal notes written either by Lamarck or by the daughter who served as his secretary when he became blind. The Geneva Museum has now undertaken the publication of an illustrated catalogue, giving figures of all the species found in Lamarck's collection, whether created by himself or by other authors. Except in those cases where the species are represented by a very large number of specimens, or sometimes badly preserved specimens, all the specimens will be figured. The accompanying text will give the diagnosis of Lamarck, the number of specimens indicated in his MS. catalogue, and the number now to be found in his collection. Other notes will be added as required. The first part, relating to the fossil brachiopods, has now been issued. It comprises twenty-two plates, and has been drawn up with the collaboration of Dr. M. Clerc and Dr. J. Faire. The complete catalogue will be issued in two series, one representing living species and the other fossil species. It is possible to subscribe to one or other of these series. After publication and distribution to subscribers, the separate sections will be sold at a slightly higher price. Further details may be obtained from Mr. M. Bedot, Directeur du Museum Naturelle, Geneva, or Messrs. Georg et Cie, libraires a Geneva.—From *The Museums Journal*, vol. 9, p. 459, June, 1910.

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No. 6

MOLLUSKS OF UNITY, MAINE.

BY S. STILLMAN BERRY.

Malacologically speaking, as it were, little Waldo county is one of the least known regions in the state of Maine. Although the town of Unity in its extreme northwest corner boasted one of the earliest conchologists of New England, little work appears to have been done since, and in glancing over the pages of Mr. Lermund's "Shells of Maine" we find that eight species and two varieties are all that the author could positively accredit to the county. The early conchologist referred to is one Dr. Milliken who sent his shells to Dr. J. W. Mighels and our present knowledge of them is gained from the lists and in one case (*Lymnæa decollata*) the descriptions of the latter. The present writer has had occasion to spend considerable leisure from time to time in the self-same town of Unity, and it is with the hope of filling in another of the gaps that the following list of mollusks collected is given.

Thanks are due to Mr. Charles W. Johnson for opportunity to compare specimens of *Lymnæa decollata* with some of Dr. Mighels' own specimens and for numerous other kindnesses. I am likewise indebted to Mr. George H. Clapp for aid in determining some of the smaller terrestrial species.

Unio complanatus (Sol.). Abundant in Lake Winnecook, as are also three following species in less degree :

Lampsilis cariosus (Say).

Lampsilis radiatus (Gmel.).

Anodonta marginata Say.

Pisidium. Perhaps half a dozen undetermined species of *Pisidium* were found in some abundance in the lake and in Sandy Stream.

Musculium secure (Prime). Common in pools on "the Intervale."

Campeloma decisum (Say). Winnecook Lake. Common.

Valvata tricarinata (Say). Winnecook Lake. Common.

Valvata tricarinata confusa Walk. Winnecook Lake, one spec.

Amnicola limosa porata (Say). Winnecook Lake and Sandy Stream. By far the most abundant species.

Lymnæa obrussa (Say). Winnecook Lake. Not found in Aug.-Sept., 1909, but common in Apr., 1910.

Lymnæa humilis modicelle (Say). Winnecook Lake. Sept., 1909, rare.

Lymnæa palustris (Müll). Pools on Intervale, Apr., 1910, common.

Lymnæa decollata (Mighels). Abundant in Lake Winnecook, the type locality (especially late in the season), where it was originally collected by Dr. Milliken.

Planorbis bicarinatus Say. Winnecook Lake. One specimen, Aug., 1909.

Planorbis campanulatus Say. Winnecook Lake. Not rare in Sept., 1909.

Planorbis exacutus Say. Winnecook Lake. Two specimens.

Planorbis hirsutus Gld. Common in the lake.

Planorbis parvus Say. With the preceding.

Planorbis parvus elevatus (Adams). Several specimens of a minute *Planorbis* were found in a bit of swamp bordering the lake. All seemed referable to this form rather than to typical *parvus*.

Dr. Milliken found also *P. trivolvis* apparently in some numbers,¹ but I did not encounter it.

Segmentina armigera (Say).

Physa heterostropha (Say). Found in Bacon's Brook and in the lake in late summer, 1909.

Physa ancillaria Say. Not encountered until April, 1910, when it was abundant along the shore of the lake, apparently displacing the preceding species.

Aplexa hypnorum (Linn.). Common in pools on the Intervale.

Carychium exiguum (Say). Windermere. Common, Sept., 1909.

Cochlicopa lubrica (Müll.). Common around wood piles, 1905, 1909.

¹ Mighels: *P. trivolvis* [+ *P. lentus*?], Bost. Jour. Nat. Hist., 1843, p. 335.

Vallonia pulchella (Müll.). Common with preceding, 1905. Rarer in 1909.

Acanthinula harpa (Say). Windermere. One specimen, Sept., 1909.

Strobilops virgo (Pils.). Windermere. Common Sept., 1909; also in woods W. of the village (Apr., 1910). All of the red variety [Clapp].

Bifidaria pentodon (Say). Windermere. Four specimens, Sept., 1909.

Vertigo ovata Say. One adult specimen in village, 1905; several juv. probably of this species at Windermere, Sept., 1909.

Vertigo gouldii (Binney). One nearly grown and several young probably the same, Windermere, Sept., 1909.

Succinea ovalis Say, (*obliqua* Say). Abundant.

Succinea avara Say. The Intervale. Four specimens, 1909-'10.

Pyramidula alternata (Say). Common in scattered localities.

Pyramidula cronkhitei anthonyi (Pils.). Abundant.

Helicodiscus parallelus (Say). Windermere, Sept., 1909, and woods W. of village, Apr., 1910. Rare.

Punctum pygmaeum (Drap.). Windermere.

Agriolimax campestris (Binn.). Common in the village.

Vitrina limpida Gld. Abundant about wood piles in 1905, but not seen in 1909.

Vitrea sp. Windermere, 1909. All young.

Euconulus fulvus (Müll.). Windermere, Sept., 1909.

Euconulus chersinus (Say), (*polygyratus* Pils.). With the preceding and about twice as abundant.

Zonitoides arboreus (Say). Abundant.

Zonitoides exiguus (Stimp). Windermere, 1909. Common.

Zonitoides milium (Morse). Windermere, Sept., 1909.

Polygyra albolabris (Say). Does not appear to be abundant, but is widely distributed.

Polygyra fraterna (Say). Several specimens in 1909.

Summary :

	Species.	Vars.
Fresh-water lamellibranchs	6	+ <i>Pisidium</i> spp.
Fresh-water gastropods	16	2
Terrestrial gastropods	24	
Total	46 +	2 +

SOME NOTES ON THE OLIVIDAE.

BY CHARLES W. JOHNSON.

II.

OLIVA VIDUA (Bolten).

Porphyria vidua Bolten, Mus. Boltenianum, p. 34, 1798.

Oliva maura Lam., Ann. du Mus., XVI, p. 309, 1810.

As in the case of *O. sericea*, both Bolten and Lamarck again refer to the same figures by Martini (Conch. Cab., II, tab. 45, figs. 472, 473). The variation of the species is well shown by Marrat under the name "*mauritiana*" Martini (Sowerby's Thes. Conch., IV, pl. 10, figs. 133-140). The figures referred to by Bolten represent one of the extreme variations. What would probably be considered the normal color is represented by the var. *sepulchralis* Lam. (Marrat, fig. 133). This variety in losing entirely the brown markings becomes the olive-green or yellowish *fenestrata* Bolten, or with the dark brown assuming wide, irregular, longitudinal stripes, the var. *fulminans* Lam., while these stripes suffusing form the dark brownish-black *vidua*. On the other hand there is a tendency for the shells to become gradually lighter in color than *sepulchralis*, such forms representing the var. *macleaya* Duclos (Marrat, fig. 140).

It is this latter variety that leads to what is probably one of the most puzzling groups of shells to define specifically that exists. One cannot realize this difficulty from a few shells which usually fall quite readily into one of the numerous species. With over 200 specimens of the group comprising *vidua*, *tigrina* and *elegans* there are some specimens so intermediate in character as to make it very difficult to draw the line. To unite these, however, upon the character of the shells alone, with the meagre data bearing upon their distribution and the environmental conditions governing variation, would in no way add to our knowledge of the group or aid in its future study. It seems to be the diverging point of a number of species or groups of species, the true relationship of which is at present hard to define.

OLIVA TIGRINA Lamarck.

O. tigrina Lam., Ann. du Mus., XVI, p. 322, 1810 (*non* Meuschen).

? *O. glandiformis* Lam., Ann. du Mus., XVI, p. 317, 1810.

This species is distinguished from *vidua* var. *macleaya* in being less cylindrical in outline with the sutural callus less elevated. The

normal form has maculations or bands of dark brown which often become suffused and cover the entire shell, this extreme variation (var. *fallax* n. var.) masquerading in many collections under the name of *maura*. The usual form of *tigrina* is without the brown bands or maculations, only the small bluish-gray spots showing. In large senile specimens the spots often become obsolete or wanting on the last third of the body whorl. The dark forms figured by Marrat as *glandiformis* (fig. 174), approach closely (as in the case of *elegans*) forms of *funeralis* Lam. The *glandiformis* Lam., if recognizable, would take precedence over *tigrina*, but the figure referred to by Lamarck in Adanson's Hist. Nat. Senegal, pl. 4, fig. 6, is not identifiable.

OLIVA BULBOSA (Bolten).

Porphyria bulbosa Bolten, Mus. Boltenianum, p. 34, 1798.

Oliva undata Lam., Ann. du Mus., XVI, p. 318, 1810.

Oliva inflata Lam., l. c., XVI, p. 319, 1810.

This variable species is always readily distinguished by having a heavy callus ridge on the fasciole, independent of the columellar plaits. In other respects many specimens closely resemble the more inflated examples of *tigrina*.

Both Bolten and Lamarck refer to the same figure by Martini (Conch. Cab., II, Tab. 47, figs. 507, 508), which represents specimens having undulating longitudinal stripes of brown. Specimens with only the small uniform bluish-gray spots constitute the var. *inflata* Lam.; when two revolving dark brown bands are present the var. *bicingulata* Lam.; when the bands fuse and cover irregularly the greater portion of the shell they represent the var. *fabagina* Lam. The latter is figured by Marrat as "crassa" Martini. Pure white examples are also frequently observed.

OLIVA ELEGANS Lamarck.

O. elegans Lam., Ann. du Mus., XVI, p. 312, 1810.

O. flava Marrat, Sowerby's Thes. Conch., IV, pl. 11, figs. 156, 157.

O. infranata Marrat, l. c., pl. 12, fig. 161.

This species, though smaller, has the more cylindrical form and elevated sutural callus of *vidua*. Light-colored examples with bright salmon-colored fasciole resemble in a general way *variegata* Bolten. It also has a similar range in color to the latter species, and lacks the

dark fulvous and melanic forms of *vidua*. Small, dark forms, on the other hand, are often very close to specimens referable to *funeralis* Lam. *O. tricolor* Lam. seems to be a good species, and not a variety of *elegans*.

OLIVA FUNEBRALIS Lamarck.

This species seem to occupy an intermediate position between *tigrina* and *elegans*. It is beautifully illustrated by Marrat (Thes. Conch., pl. 11, figs. 143-148) under the names of "*leucostoma*" Ducl. and "*labradorensis*" Bolten. The figure cited by Bolten in Lister, tab. 731, fig. 20, is unrecognizable, so that *labradorensis* can fortunately be dropped. The narrower form suggests a probable relationship to the narrow, cylindrical *mustelina* Lam., while the broader form shows a tendency towards the more inflated *dactyliola* Ducl.

OLIVA DACTYLIOLA Duclos.

This seems to hold an intermediate position between *funeralis* and *bulbiformis*, having the spire of the former and outline of the latter.

OLIVA BULBIFORMIS Duclos.

This species is distinguished from the preceding in having a much smaller spire usually entirely covered by a callus. *Oliva similis* Marr., is evidently a variety without the callus spire. This species seems to naturally lead to the small callus-spired species, such as *mucronata* Marr., *lepida* Ducl., *todosina* Ducl., *carneola* Gmel., *tessellata* Lam., etc.

OLIVA CARNEOLA Gmelin.

There are entirely or partially mottled specimens of this species which seem to connect *lepida* and *todosina* with this species.

OLIVA MUSTELINA Duclos.

The deep suture and cylindrical form, often noticeably narrower towards the anterior, suggest an approach to *scripta*. Specimens with interrupted revolving bands constitute the var. *angustata* Marr. *O. athenia* Ducl., resembles this species in miniature.

OLIVA SCRIPTA Lamarck.

The suture is deep and wide. The color markings resemble *O. litterata* Lam.

OLIVA VARIEGATA (Bolten).

Porphyria variegata Bolten, Mus. Boltenianum, sp. 393, p. 33, 1798.

Porphyria reticulata Bolten, Mus. Boltenianum, sp. 396, p. 33, 1798.

Oliva sanguinolenta Lam., Ann. du Mus., XVI, p. 316, 1810.

Oliva evania Duclos, Monogr., in Comp. Rendus, II, tab. 20, figs. 3, 4, 1836.

This species varies from the grayish-white reticulated form first referred to by Bolten, to the dark, finely reticulated olive-green var. *reticulata*. In the latter case both Bolten and Lamarck refer to the same figures by Martini (Conch. Cab., II, tab. 48, figs. 512, 513). The fasciole is always a bright orange red, the spire finely marked with brown, and the two revolving bands usually quite distinct. A number of specimens from Negros Island, Philippines, collected by Mr. E. L. Moseley, are all the var. *reticulata*, and show but little variation. Marrat is undoubtedly wrong in uniting Bolten's *variegata* with Lamarck's *tricolor*. *O. evania* is only a very light-colored example.

OLIVA TRICOLOR Lamarck.

This species has the outline of *variegata* and not of *elegans*; it has the salmon-colored fasciole, but the color of the shell is very different from either. The dark specimens are bluish-green, with bands of a slightly darker shade—not brown; the entire shell is spotted with yellow, spire and lip coarsely marked with brown. Light-colored specimens often have bright yellow and blue spots; with the bands obsolete or wanting, such specimens often resemble *caerulea* so closely as to be only separated by the violet-colored aperture of the latter.

OLIVA CAERULEA (Bolten).

Porphyria caerulea Bolten, Mus. Boltenianum, p. 33, 1798.

Oliva episcopalis Lamarck, Ann. du Mus., XVI, p. 313, 1810.

Although the two authors refer to different figures there seems to be no doubt as to their identity. Bolten refers to a very good figure by Martini (Conch. Cab., II, tab. 48, fig. 518), while Lamarck cites an uncolored though recognizable figure by Lister (tab. 719, fig. 3), with a description of the species. The revolving bands which are obsolete or wanting in the adult shell, are quite prominent in younger specimens which closely resemble some variations of *ispidula*.

Young specimens are also before me in which the violet color of the aperture is wanting.

OLIVA AMETHYSTINA (Bolten).

Porphyria amethystina Bolten, Mus. Bolt., p. 35, 1798.

Voluta cruenta (Solander) Dillw. Call, I, p. 514, 1817.

Oliva guttata Lam., Ann. du Mus., XVI, p. 313, 1810.

Both Bolten and Lamarck refer to the same figures by Martini (Conch. Cab., II, tab. 46, figs. 491, 492). The variation of the species is well shown by Marrat under *emicator* Meuschen (Thes. Conch., pl. 5, figs. 57-60). This species may vary from spotless to the typical form with large regular spots, or to that with large splotches and fine flecks. Many specimens show a peculiar malformation consisting of an elevated ridge at the periphery. Additional synonyms by Marrat are *aurata* Link and *mantichora* Duclos.

OLIVA ISPIDULA Linné.

As stated under *cærulea* varieties of this species closely resemble the younger and smaller examples of that species. The species is extremely variable, more so, perhaps, than any other, notwithstanding it is as a rule readily recognized by its brown aperture. Specimens from Samar, Philippines, collected by Mr. E. L. Mosely, are all uniform in color, representing the dark reticulated form (Marrat, Thes. Conch., fig. 248). The var. *flaveola* Duclos is yellow with a white aperture; its relation to *ispidula* is apparent from the fact that specimens frequently show a trace of the broad dark subsutural band common to many of the typical examples. This species seems to lead to the small high-spired species, including *O. flamulata* Lam., *duclosi* Reeve (*jaspidea* Ducl., non Gmel.), *rufopicta* Wienk., *kaleontina* Ducl., *australis* Ducl., *panniculata* Ducl., etc., some of which resemble species of *Olivella*.

MOLLUSKS OF UNIONVILLE, CONN.

BY FRANK C. BAKER.

In June, 1909, several days were spent in the village of Unionville, and much of the time was enjoyably occupied in hunting for the lowly mollusks. As local lists from Connecticut are rare, it has been thought that a catalogue of the species obtained might be of value for the purpose of geographic distribution. Unionville is about nine miles west of Hartford.

PELECYPODA.

Anodontoides ferussacianus subcylindraceus (Lea). Roaring Brook.

Anodonta marginata Say. Farmington River, above dam.

Alasmodonta undulata (Say). Mill race, near dam ; Roaring Brook.

Unio complanatus (Sol.). Mill race, near dam ; Roaring Brook ; Pond's Brook.

Margaritana margaritifera (Linné). Pond's Brook.

Pisidium subrotundum Sterki. Small pools in swamp ; Cherry Pond Creek.

GASTROPODA.

Campeloma decisum (Say). Roaring Brook ; Farmington River, above dam.

Physa sayii Tappan. Overflow from mill race ; Cherry Pond ; small stream flowing into Farmington River above dam.

Planorbis bicarinatus Say. Cherry Pond ; small streams above dam, Farmington River.

Segmentina armigera (Say). Cherry Pond ; drainage ditch east of Cherry Pond Creek (on bottom in grass).

Lymnaea columella (Say). Cherry Pond.

Strobellops labyrinthica (Say). Top of hills, east of Farmington River.

Succinea ovalis Say. Lewis' Woods.

Succinea avara Say. Lewis' Woods.

Philomycus carolinensis (Bosc.). Cherry Park, under log.

Helicodiscus parallelus (Say). Top of hills, east of Farmington River.

Zonitoides arborea (Say). Woods east of Roaring Brook ; Cherry Park ; top of hills east of Farmington River.

Zonitoides nitida (Müller). Near Curtis' Pond.

Euconulus fulvus (Müller). Top of hills, east of Farmington River.

Vitrea indentata (Say). Top of hills, east of Farmington River.

Vitrea hammonis (Ström.). Woods east of Roaring Brook ; Cherry Park.

Polygyra hirsuta (Say). Top of hills, east of Farmington River ; woods east of Roaring Brook.

Polygyra fraterna (Say). Lewis' Woods.

Polygyra albolabris (Say). Woods east of Farmington River.

PUBLICATIONS.

MOLLUSCA OF THE SOUTHWESTERN STATES. III: THE HUACHUCA MOUNTAINS, ARIZONA. IV: THE CHIRICAHUA MOUNTAINS, ARIZONA—By H. A. PILSBRY and J. H. FERRISS. (Proc. Acad. Nat. Sci., Phila., Nov., 1909, and Feb., 1910.) In a notice of an earlier number of this series I recalled the way in which the malacological riches of the arid southwest were first brought prominently to light, and the astonishment they created. Nowadays we have become so accustomed to hearing of new things from that region, that we no longer get excited over additions to *Ashmunella*, *Sonorella* or *Oreohelix*. If the first flush of discovery has thus departed, and in a certain sense the continuation of the work is almost monotonous, it must be remembered that we are approaching a second stage, in which the abundance of the data will permit generalization not to be thought of before. Thus the important scientific results lie in front and not behind, and it is only through minutely careful survey work, like that of Messrs. Pilsbry and Ferriss, that they will ever be realized. Already these authors feel justified in making the following interesting statement:

“The facts developed in our Arizona work lead us to doubt the potency of environment as a direct agent in effecting specific differentiation, or at least to assign to such factors a wholly subsidiary role. The facts seem explicable only on the hypothesis of variations existing or arising in the constitution of the egg, leading to modifications of the adult organism which for the greater part are indifferent as affecting the well-being of the race. Such adaptation as exists would apparently be due to selection. The isolation of small colonies in these mountains must favor the survival of what are currently called mutations occurring therein. The occasional mingling of neighboring colonies in which diverse variations have arisen seems to have led to such heterogeneous colonies as we have described in *Holospira*.”

In a footnote is added:

“We believe this to be the explanation of the diversity of colonies in the polychromatic arboreal snails such as *Partula* and *Liguus*, in which some colonies of a given species are homogeneous, while others are heterogeneous, snails of several definite color-patterns being the offspring of a single mother.”

In this connection it is interesting to compare Prof. W. L. Tower's results with Mexican beetles of the genus *Leptinotarsa*, recently pub-

lished in *Biological Bulletin*, May, 1910. Tower found two closely allied beetles occupying different sides of the Mexican table-land, and was able to cross them, getting various combinations in the offspring, an interesting feature being that the larval characters were inherited separately, so that in one experiment four different kinds of larvæ *each* gave the same three kinds of adults. The account of the experiments is not altogether clear and consistent, but it is evident that among these beetles related forms may cross quite freely, and produce fertile progeny presenting new combinations of the parental characters. As Messrs. Pilsbry and Ferriss have indicated, it is not unlikely that similar phenomena occur among snails, and no doubt there is a rich field open to the experimental breeder.

The two papers before us give an account of the snails of the Huachuca and Chiricahua mountains. The first Huachuca snails to be collected were species of *Ashmunella* (*A. varicifera* and *levettei*), obtained by Messrs. Cox and Levette, and reported as from "Tucson" and "near Santa Fé, New Mexico," respectively. It is now definitely ascertained that they are confined to the Huachucas. The authors state that they know nothing of Cox beyond his name upon the label, but he was doubtless the Cox who was known to entomologists as a collector of cynipid galls, one of the gall-flies being named after him by Bassett. The first Chiricahua mollusc was obtained by Vernon Bailey, and was described by Stearns in 1890 as *Holospira arizonensis*. The richness and individuality of the snail-faunæ of these ranges is well brought out by the following table, which includes species only :

	Huachucas only.	Both ranges.	Chiricahuas only.
<i>Sonorella</i> . . 4	0	6	
<i>Ashmunella</i> . 4	0	9	
<i>Oreohelix</i> . . 1	0	3	
<i>Pyramidula</i> . 1	1	0	
<i>Helicodiscus</i> . 0	1	0	
<i>Radiodiscus</i> . 0	1	0	
<i>Punctum</i> . . 0	0	1	
<i>Thysanophora</i> 0	1	1	
<i>Holospira</i> . . 1	0	3	
<i>Agriolimax</i> . 0	1	0	
<i>Vitrina</i> . . . 0	1	0	
<i>Zonitoides</i> . . 0	3	0	

<i>Vitrea</i> . . . 0	1	0
<i>Euconulus</i> . . 0	1	0
<i>Succinea</i> . . . 0	1	0
<i>Vallonia</i> . . . 1	1	0
<i>Pupilla</i> . . . 0	1	0
<i>Bifidaria</i> . . 1	4	4
<i>Vertigo</i> . . . 2	2	2
<i>Cochlicopa</i> . . 0	1	0
15	21	29

There are in addition numerous local races or subspecies of the *Helicidæ*. All the larger snails of the Chiricahuas, 21 species with 14 subspecies, are wholly confined to that range. The small snails, on the other hand, are widely distributed.

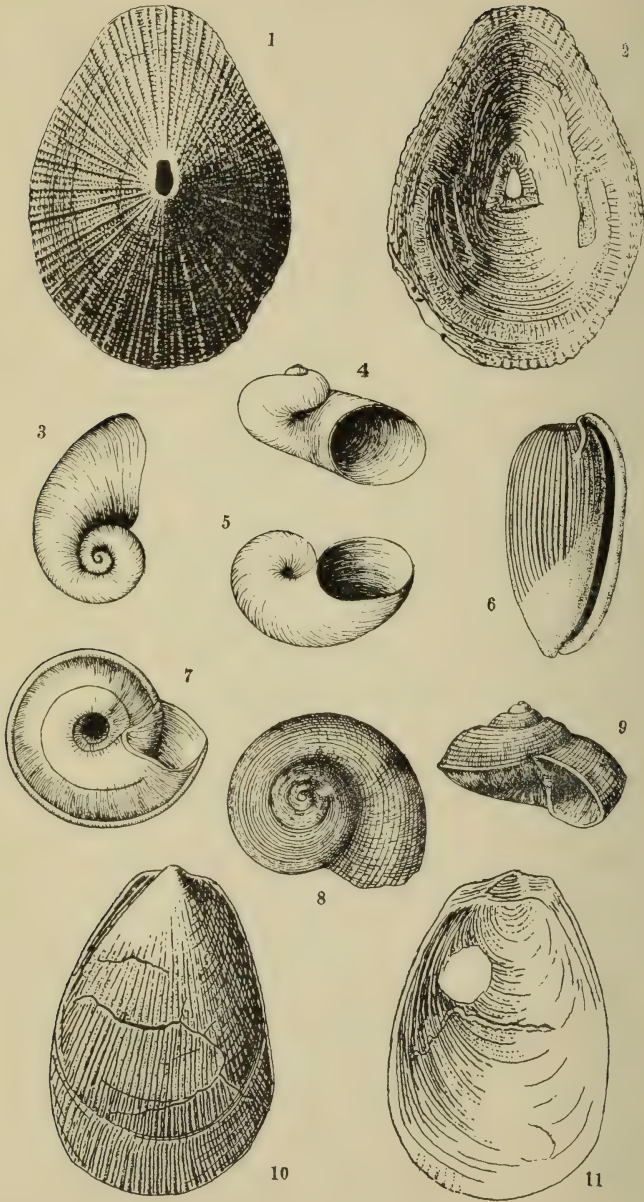
It will be seen from the above that Messrs. Pilsbry and Ferriss have not only made very important additions to the snail fauna of the United States, but have contributed most valuable data toward the elucidation of those problems of heredity and evolution which are puzzling us all. May they have the time and strength for many other such contributions.

T. D. A. COCKERELL.

NOTES.

SHELLS OF MT. EQUINOX, VERMONT.—The following species were obtained by the writer on the eastern side of Mt. Equinox, near Manchester, Vt., in June, 1910, on one of the collecting trips of the Boston Society of Natural History, in company with Messrs. G. M. Allen and J. A. Cushman: *Polygyra albolabris* Say, *P. sayana* Pils., *P. tridentata* Say, *P. fraterna* Say, *Circinaria concava* Say, *Pyramidula alternata* Say, *P. cronkhitei anthonyi* Pils., *Omphalina fuliginosa* Griff., *Zonitoides arborea* Say and *Succinea ovalis* Say. In a small lake at the foot of the mountain *Lymnæa desidiosa* Say, *Planorbis bicarinatus* Say and *Physa heterostrophæ* Say were also obtained.—C. W. JOHNSON.

W. F. PETTERD.—In Hobart, Tasmania, on April 15, 1910, occurred the death of Mr. W. F. Petterd, a veteran conchologist. He wrote considerable on the land shells of his native island. Mineralogy was another study to which he had made valuable contributions. He had traveled extensively in Australia and the Pacific islands.—C. HEDLEY.



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No. 7

NEW EOCENE FOSSILS FROM THE SOUTHERN STATES.

BY T. H. ALDRICH.

[Plate IV, fig. 6, OVULACTÆON ALDRICHI Wheeler, described in the June No., p. 13.—ED.]

FISSURIDEA MAURYI n. sp. Pl. IV, figs. 1, 2.

Shell large, of medium height, narrowed at the anterior, and bent slightly downward; regularly oval on the posterior. Foramen rather large, somewhat keyhole-shaped; shell radiately sculptured, with about 32 strong primary ribs, generally with two smaller ribs between, at the anterior the ribs are nearly equal and closely set, the crossbar to the foramen deeply pitted, and the foramen itself triangular within.

The close-set lines of growth are very numerous; they break up the ribs into low nodules. Margin of shell strongly crenulate and flattened within. Longest diam. 31 mm.; breadth 24 mm.; height 11 mm.

Locality. Matthews Landing bed on Dale Branch, near Oak Hill, Ala. Named in honor of Miss Carlotta J. Maury, a co-worker in Tertiary palæontology. Figures by Prof. G. D. Harris.

ADEORBIS? NAUTILOIDES n. sp. Pl. IV, figs. 3, 4 and 5.

Shell very small, substance rather thin; whorls three, expanding rapidly. The body whorl separating and extending beyond the other whorls; surface smooth except near the aperture where a few growth lines become coarser; umbilicus small. The figure does not show the separation of the whorls well.

Longest diam. about 2 mm.

Locality. De Soto, Miss. Claibornian.

Remarks. This singular little species is doubtfully placed in *Adeorbis*. It might just as well be put in *Valvata*. It is hardly an embryonic shell, but in any event it is an interesting development wherever it really belongs.

ADEORBIS SOTOENSIS n. sp. Pl. IV, figs. 7, 8, 9.

Shell small, whorls five; spire pointed, smooth; whorls covered with spiral lines which are nearly obsolete just below the suture, growing more prominent on the body whorl as they approach the periphery. The effect is to make a broad, nearly smooth band on the whorls to the eye; under a glass this space shows exceedingly fine spirals. Body whorl strongly keeled, base smooth, umbilicus moderate. Aperture ovate. Diameter a little less than 2 mm.

Locality. De Soto, Miss., just above the *Ostrea sellæformis* bed. Claibornian.

LIMA HARRISIANA n. sp. Pl. IV, figs. 10, 11.

Shell oblong, slightly oblique, radially sculptured, covered with close-set lines slightly nodular; between them in the sunken spaces are fine dotted lines which die out towards the hinge line and umbo. The ribs are very numerous, near the umbo on one side they appear quite nodulous; ears very unequal, hinge nearly straight, but somewhat inclined to the central axis. In a young specimen the outer ribs appear to be nodulous and the inner margin denticulated.

Longest axis 17 mm.

Locality. Smithville, Texas. Claibornian.

Remarks. This species seems to be rather close to *L. vicksburgiana* Dall, but has many more ribs, over 50 in all.

Named in honor of Prof. G. D. Harris, who has kindly furnished the illustrations.

ERRATA.

In Bulletin of American Paleontology, No. 8, 1897, p. 10, Pl. II, fig. 5, I described a small shell as *Actæon cossmanni*. This should have been written *Acteonina* (*Crenilabium*) *cossmanni*, nobis. A mistake was made in transcribing. It was however manifest as the writer placed it in the proper subgenus.

EULIMA COSSMANNI n. sp.

M. Cossmann has figured in "Notes Complementaires," Pl. I, fig. 34, page 27, 1893, as *Rissoina notata* Lea, a form that is not the species of Lea but a new form of *Eulima*, which may be called *E. cossmanni*. The shell described by Lea is also a *Eulima*.

The description and figure given by M. Cossmann are accurate for this new species. The true species of Lea also has a sinuous outer lip.

Dr. Paul Bartsch has examined specimens of the true *Pasithea elegans* H. C. Lea, and finds it to be a *Bitium*.

NOTES ON TRUNCILLA, WITH A KEY TO THE SPECIES.

BY BRYANT WALKER.

As the highest expression of *Unione* development, the *Truncilla* are of special interest to the systematic conchologist. Not only are the sexes sharply differentiated in all the species, but the species themselves are more clearly defined and less subject to variation than in any other of the recognized genera.

For this reason, the species are well adapted to the rigid limitations of a key, which in the more variable groups would, in many cases, be almost impracticable. But in genera such as this, where the specific lines can be drawn with sufficient exactness for such a purpose, the formation of a key, besides facilitating the identification of the species, is of great service in developing the peculiar distinguishing characters of the different species, and thus determining their proper position in a natural arrangement.

In attempting to make a key to the species of *Truncilla*, it almost immediately became obvious that, owing to the extreme differentiation of the sexes, which very often was not along analogous lines in species of the same group, a single key including both sexes was not feasible, and accordingly a separate key for each sex was made.

This condition also demonstrated that a consistent natural arrangement of the species would have to be based primarily on the variations of one of the sexes.

In view of the fact that the most recent classification of the *Unionida* is based primarily on the modifications of the gill of the

female incident to reproduction, and that *Truncilla* is the genus in which the sexual differentiation of the female has been carried out to the greatest extent, it would seem desirable that a systematic arrangement of the species in the genus should be, as far as possible, based on that feature.

At the present time such an arrangement must necessarily be based almost wholly on shell characters, and these are mainly to be found in the position of the so-called marsupial expansion. The indications afforded by these characters should, of course, be supplemented by an exhaustive study of the gill itself and its modifications for the purpose of a marsupium, and, until that is done, it is scarcely advisable to attempt to define the subordinate groups in any formal manner or to change the present classification.

In respect to their peculiar shell characters, the female *Truncilla* fall naturally into three groups :

1. Those in which the entire post-basal area is occupied by the marsupial expansion.

This group is more closely allied in this respect to *Lampsilis* than any of the others, and is apparently the more primitive form. *T. perplexa* is the leading exponent of this group.

2. Those in which the marsupial expansion is restricted substantially to an inflation and modification of the posterior ridge.

This might be considered the next stage of development, and is typified by *T. triquetra*.

3. Those in which the marsupial expansion is anterior to the posterior ridge and more or less distinctly separated from it.

The extreme form of this group is the well-known *T. foliata*, which may well be considered the most highly organized species of the genus. Between it and *T. hayesiana*, in which the expansion, though anterior to the posterior ridge, is scarcely differentiated from it, and which may, therefore, be considered the other extreme of the series, there is a very considerable amount of variation in this particular. An intermediate stage is that represented by *T. sulcata* and *lenior*, in which the expansion, though distinct, is separated from the posterior ridge by a narrow but deep sulcus, which forms a distinct notch at the margin, instead of the wide emargination that is present in *foliata* and its immediate allies.

Arranged in this way the species show a distinct line of evolution, from the simple to the complex, caused by the progressive differ-

entiation of the marsupial expansion and its advance from a position at the extreme posterior part of the shell to a median one almost directly under the beaks.

An arrangement of the species in this manner would result as follows:

1. Marsupial expansion occupying the entire post-basal area :

<i>T. perplexa</i> ,	<i>T. biemarginata</i> ,
<i>T. perplexa rangiana</i> ,	<i>T. capsæformis</i> ,
<i>T. sampsoni</i> ,	<i>T. florentina</i> ,
<i>T. propinqua</i> ,	<i>T. deviata</i> .

2. Marsupial expansion formed by an inflation of the posterior ridge :

A. Not extending below the basal line :

<i>T. triquetra</i> ,	<i>T. arcaæformis</i> .
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B. Extending below the basal line :

<i>T. penita</i> ,	<i>T. compacta</i> ,	<i>T. metastrata</i> .
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3. Marsupial expansion in front of the posterior ridge and more or less separated from it :

A. Scarcely differentiated from the posterior ridge :

<i>T. hayesiana</i> ,	<i>T. modicella</i> ,	<i>T. othcaloogaensis</i> .
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B. Separated from the posterior ridge by a narrow sulcus, notching the post-basal margin :

<i>T. brevidens</i> ,	<i>T. sulcata</i> ,	<i>T. lenior</i> .
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C. Separated from the posterior ridge by a wide emargination :

<i>T. personata</i> ,	<i>T. lewisi</i> ,
<i>T. stewardsonii</i> ,	<i>T. foliata</i> .

It is to be noted that while *brevidens* from the position of the expansion falls in this group, in other characters it is more closely related to *penita* and *compacta* and thus forms a connecting link between the two groups. It might, perhaps, be considered an example of development along similar lines arising from a different ancestral stock. It also illustrates the futility of attempting to draw arbitrary lines in any system of classification. Nature does not do things in that way.

In this arrangement, the synonymy as established by Simpson is followed, with the exception that *T. compacta* Lea is recognized as distinct from *penita* Con. Mr. Simpson informs me that, from the examination of additional material since the publication of the Synopsis, he has come to the same conclusion.

T. metastriata is doubtfully distinct from *compacta* and is probably, at the most, only a local form peculiar to the Black Warrior river. If this is correct, it has priority over *compacta*.

The male of *T. othcaloogaensis* is unknown.

KEY TO THE SPECIES OF TRUNCILLA.

A. Males.

1. { Shell with a distinct radial furrow in front of the posterior ridge 2.
 { Shell without a distinct radial furrow in front of the posterior ridge 12.
2. { Shell subquadrate or subtriangular; radial furrow subvertical 3.
 { Shell suboval; radial furrow oblique 8.
3. { Shell subcompressed, subquadrate or broadly subtriangular; umbonal region flattened, beaks depressed 4.
 { Shell subtriangular; beaks elevated, umbonal region inflated 7.
4. { Posterior ridge strongly biangulate *biemarginata*.
 { Posterior ridge rounded 5.
5. { Central ridge well developed, forming an obtuse angle in the basal line at its extremity, between which and the posterior ridge the base line is nearly straight, radial furrow wide and conspicuous 6.
 { Central ridge less developed, not projecting beyond the basal outline, which is scarcely emarginate in front of the posterior ridge, radial furrow subobsolete . . . *stewardsonii*.
6. { Shell subquadrate, solid, central ridge subnodulous, radial furrow deep *foliata*.
 { Shell smaller, subsolid, central ridge smoother, radial furrow less impressed *lewisii*.
7. { Posterior slope smooth, nacre white *personata*.
 { Posterior slope radially striate, nacre usually purple. *hayesiana*.
8. { Posterior slope convex, posterior end below the middle . . 9.
 { Posterior slope nearly straight, posterior end at or above the middle 10.
9. { Central ridge nodulous *perplexa*.
 { Central ridge smooth *propinqua*.
10. { Post-basal margin emarginate 11.
 { Post-basal margin squarely subtruncate *sulcata*.
11. { Shell short oval, post-basal emargination deep, umbonal region greatly inflated *sampsoni*.
 { Shell more elongate, post-basal emargination shallow, umbonal region less inflated *perplexa rangiana*.
 { Shell smaller, posterior ridge biangulate, basal emargination shallow, beaks prominent *deviata*.

- | | | | |
|-----|---|--|----------------------|
| 12. | { | Posterior ridge rounded | 13. |
| | { | Posterior ridge more or less distinctly biangulate | 19. |
| 13. | { | Posterior slope distinctly flattened | 14. |
| | { | Posterior slope not flattened | 18. |
| 14. | { | Umbonal region flattened | 15. |
| | { | Umbonal region inflated | 16. |
| 15. | { | Shell subquadrate, subcompressed | <i>brevidens.</i> |
| | { | Shell smaller, oval, less compressed, beaks more anterior. | <i>metastriata.</i> |
| 16. | { | Shell distinctly triangular, anterior margin not projecting
much beyond the anterior umbonal slope, unicolored or
with capillary green rays | 17. |
| | { | Shell triangularly ovate, anterior margin projecting beyond
the umbonal slope, conspicuously painted with green rays
and blotches | <i>triquetra.</i> |
| 17. | { | Beaks flattened, subcentral | <i>penita.</i> |
| | { | Beaks higher, more anterior, shell smaller | <i>compacta.</i> |
| 18. | { | Shell small, subtriangular, thick and solid | <i>modicella.</i> |
| | { | Shell larger, oval and thin | <i>lenior.</i> |
| 19. | { | Shell large, greatly inflated, thick, solid, posterior ridge very
prominent, posterior slope with a well-defined furrow, sur-
face rough, rays capillary | <i>arcaiformis.</i> |
| | { | Shell smaller, less inflated, posterior ridge less developed,
surface smooth, broadly rayed with green | 20. |
| 20. | { | Shell subcompressed, elliptical | <i>capsaiformis.</i> |
| | { | Shell smaller, short oval, quite inflated | <i>florentina.</i> |

B. *Females.*

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|----|---|---|-----|
| 1. | { | Marsupial expansion swollen | 2. |
| | { | Marsupial expansion flattened | 13. |
| 2. | { | Marsupial expansion an inflation of the posterior ridge . . | 3. |
| | { | Marsupial expansion in front of and distinctly separated
from the posterior ridge | 9. |
| 3. | { | Posterior ridge angularly inflated and curved backwards . | 4. |
| | { | Posterior ridge roundly inflated and curved forwards . . | 5. |
| 4. | { | Posterior ridge sharp, dorsal slope obliquely truncate, flat-
tened, base of expansion rounded <i>triquetra</i> . | |
| | { | Posterior ridge less angular, dorsal slope not flattened, bi-
angular, base of expansion flattened <i>arcæformis</i> . | |
| 5. | { | Base of expansion distinctly projecting beyond the basal
line | 6. |
| | { | Base of expansion scarcely projecting beyond the basal
line | 8. |

6. { Posterior ridge inflated, basal expansion rounded, its margin rounded 7.
 { Posterior ridge not inflated, basal expansion flattened, its margin subquadrate *penita*.
7. { Shell large, subquadrate, disk distinctly flattened, with numerous, fine, capillary rays *brevidens*.
 { Shell smaller, subtriangular, posterior ridge inflated, rayless. *compacta*.
 { Shell still smaller, beaks less elevated, greatly inflated posteriorly, rayless *metastriata*.
 { Shell very small, subquadrate, marsupial expansion narrow and not much inflated *modicella*.
8. { Posterior slope radially striate, a median furrow in front of the marsupial expansion, nacre usually purple . *hayesiana*.
 { Posterior slope scarcely striate, no median furrow, nacre white *othcaloogaensis*.
9. { Marsupial expansion a prolongation of the median ridge, separated from the posterior ridge by a wide emargination 10.
 { Marsupial expansion occupying and nearly filling the radial furrow, not projecting beyond the basal line . . *personata*.
 { Marsupial expansion at posterior base and separated from the posterior ridge by a deep sulcus, notching the margin . 12.
10. { Marsupial expansion rounded 11.
 { Marsupial expansion triangular *lewisii*.
11. { Shell large, center of disk inflated, marsupial expansion separated from posterior ridge by a deep median furrow. *foliata*.
 { Shell much smaller, center of disk compressed, no median furrow *stewardsonii*.
12. { Shell quadrate, rather solid, marsupial expansion extending beyond the posterior ridge *sulcata*.
 { Shell smaller, oblong, thin, marsupial expansion not extending beyond the posterior ridge *lenior*.
13. { Entire post-basal region flatly and broadly expanded, marsupial extension thin, shining, and of different texture from the rest of the shell 14.
 { Expansion of the post-basal region less extensive, less compressed, and of the same color and texture as the rest of the shell 15.
14. { Shell with a distinct radial furrow and nodulous median ridge *perplexa*.
 { Shell smaller, smooth, and without a distinct radial furrow. *capsæformis*.
15. { Shell with a distinct radial furrow extending to the beaks. 16.
 { Shell without a distinct radial furrow 17.

16. { Shell oval, umbonal region inflated, beaks prominent, posterior ridge rounded *propinqua*.
 { Shell subquadrate, umbonal region compressed, beaks flattened, posterior ridge biangulate *biemarginata*.
17. { Shell larger, solid, margin of marsupial expansion simple. 18.
 { Shell much smaller, thinner, margin of marsupial expansion dentate 19.
18. { Shell subquadrate, marsupial expansion small, posterior margin subtruncate, umbonal region greatly inflated. *sampsoni*.
 { Shell oval, marsupial expansion larger, posterior margin regularly rounded, umbonal region less inflated . *rangiana*.
19. { Shell obovate, marsupial expansion extending below the base line, beaks depressed, dorsal slope rounded . *florentina*.
 { Shell subtriangular, marsupial expansion not extending below the base line, beaks prominent, dorsal margin elevated *deviata*.

SHELLS FROM THE BAY OF CADIZ REGION.

BY MAXWELL SMITH.

While on a recent visit to Spain I arranged to spend three days on the shores of the Bay of Cadiz in hopes of contributing toward the knowledge of its molluscan fauna. With the limited time at my disposal only a superficial inspection of the beaches could be made, but the results were so satisfactory, although yielding only a comparatively small series of species, that I felt that I was indeed amply repaid.

By comparing the list which follows this article it will be seen that the material brought together is a curious mixture of Mediterranean, African and Atlantic shells. Just what lives in the bay, and what not, can only be determined by careful dredgings.

Through the kindness of Mrs. Whishaw, of Seville, her summer home, an old palace dating from the 16th century, was placed at our disposal. This was located on the shore of the Bay of Cadiz at the town of Port Saint Mary, or Puerto de la Santa Maria as it is called in Spanish.

It was on April 30 of this year that we left the heat of Seville and rode by train through this rich wine-growing section of the country down to the bay. Port Saint Mary was found to be a typical Spanish

town, with its one long, wide street lined with whitewashed houses and palaces of better days. It is a sleepy town all day, when the sun shines week in and week out, but at sunset there is a change. The inhabitants throng the streets, and the men loading the steamers along the river side with sherry work harder than ever. Most of this goes to America, and comes from near Jerez, upstream. It is brought down by river or railway from the country and transferred to an ocean-going freighter at Port Saint Mary. This seems to be the only industry of the place besides fishing. At this season of the year few shell fish were offered for sale at the market.

Port Saint Mary was far from a dull place to me, as it might have proved to some persons. Every moment was occupied in searching the beaches, the tide flats and the infrequent bits of rock.

It was the day after I arrived that I made an excellent "find." A long search had been made for minute species with little success when I came across the following: A small cup-shaped depression was observed in the sand, over which ran several streamlets. This was filled with thousands, perhaps tens of thousands, of minute shells all in perfect preservation. As the tide was rapidly coming in the only thing to do was to gather together as much of the material as was possible and bring along. This was done, and it required many hours of following days to work the lot out.

Upon my return to Seville a few days later Mrs. Whishaw kindly gave me a number of species which she had obtained herself on the beaches. Those of the lot, which I had not taken myself, I have incorporated in the appended list.

Several walks were made to distant portions of the shore line. These have been noted in the list, giving the name of the nearest town.

To Mrs. Whishaw I owe many thanks for help and suggestions, besides a series of local material from the bay taking during the last few summers. In preparing the following catalogue I am especially indebted also to Messieurs Lamy and Germain, of the Malacological Laboratory, of Paris, for assistance in determinations.

CEPHALOPODA.

Sepia officinalis L. A few.

Spirula pronii Lam. Mrs. Whishaw, several shells.

GASTROPODA.

Helix apicina Lk. On the ground.

Helix barbula Charp. On plants and cacti. Puerto Real.

Helix lactea Müll. Common at the roots of dwarf palms. Near Puerto Real.

Helix marmorata Fer. Ascends walls of houses at Port Mary, doubtless feeding on lime.

Helix nemausensis Bgt. One example.

Alexia myosotis Drap. Puerto Real, on mud flats, dead.

Alexia firmini Payr. Two Examples. Puerto Real.

Siphonaria algesirae Q. & G. Beaches. Not rare.

Bulla striata Brug. From the number of dead shells this must live in the bay.

Haminea elegans Leach. Several.

Conus mediterranea Hw. Not plentiful.

Mangilia vauquelini Payr. Brown-banded form.

Surcula undatirugata Biv. Mrs. Wishaw.

Clathurella linearis Mtg. A distinct little species.

Marginella miliaria L. Numerous in drift.

Marginella philippii Mont. With the latter.

Cymbium olla L. Mrs. Wishaw, several.

Pisania maculosa Lk. Not common.

Pisania d'orbignyi Payr. Mrs. Wishaw. Finely colored.

Euthria cornea L. Mrs. Wishaw. *Nassa corniculum* Oliv. A few.

Nassa corniculum raricostata Risso. Aperture violet.

Nassa incrassata Müll. A common orange-colored shell.

Nassa mutabilis L. Minor form.

Nassa reticulata L. Plentiful in muddy stations with the following :

Cyclonassa neritea L. Alive in vast numbers.

Cyclonassa pellucida Risso. A single specimen.

Columbella rustica L. Mrs. Wishaw, several.

Murex brandaris L. Apparently rare.

Murex erinaceus L. Many worn shells, seldom fresh.

Purpura haemostoma L. In a semi-fossil condition near Puerto Real.

Lotorium cutaceus L. The three of this family from fishermen.

Lotorium corrugatum Lk. *Lotorium nodiferum* Lk.

(To be continued.)

NOTES.

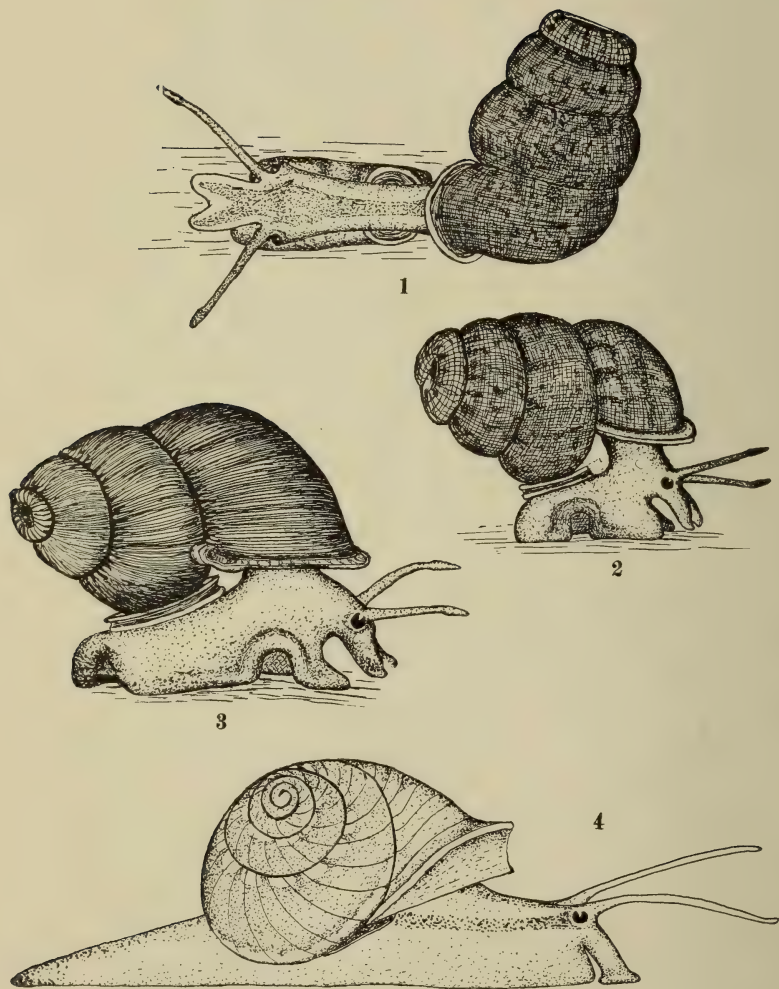
PLAGUE OF HUGE SNAILS.—A plague of snails on the coast of Ceylon is assuming serious proportions. Millions of snails are to be found, and some of them weigh as much as one pound. The snails have begun feeding on the young cocoanut trees, and it is feared that they may attack the young rubber trees. The government is taking measures to check the devastation.—*London Daily Chronicle*.

THE VIRGINIA COLONY OF *HELIX NEMORALIS*.—In a recent letter from Mrs. John M. Brooke she says: "Of *Helix nemoralis* I have seen very little of late, my home having been in Washington, D. C., for about three years. On my return to Lexington, Va., in August of this year there seems to be no diminution, however, in numbers that came out after a rain, the prevailing colors being the plain lemon-yellow and the regular five-banded form, but I have made no careful selection. We have had a terrible drouth, and they keep under shelter in dry weather, so I am unable to give you any connected observations. Only after a rain do they come out upon the rocks and fences in numbers."—C. W. J.

SIR CHARLES ELIOT is the author of a supplement to Alder and Hancock's well-known work, "The British Nudibranchiate Mollusca," published by the Ray Society. Important chapters on bionomics, classification, anatomy, etc., precede the descriptions of genera and species. Eight colored plates, partly from drawings left by Hancock, illustrate the work.

WE learn with deep regret of the death on September 25th of Dr. Oskar Boettger, of Frankfort a. M., equally known for his work in malacology, palæontology, and herpetology.

MESSRS. FERRISS, PILSBRY and DANIELS have returned from their camps in Arizona, where about ten weeks were spent in the Santa Rita, Baboquivari, Santa Catalina and Dragoon mountains, and in the Hachita Mts., N. M. About twenty-five new species of land shells are among the spoils of the expedition.



A. P. Brown, del.

1, 2, ADAMSIELLA IRRORATA. 3, COLOBOSIYLUS BRONNII.
4, HELICINA NERITELLA ANGULATA.

THE NAUTILUS.

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THE METHOD OF PROGRESSION OF SOME LAND OPERCULATES FROM JAMAICA.

BY AMOS P. BROWN, PH. D.

Certain operculate land snails from Jamaica, especially members of the genera *Annularia*, *Colobostylus*, *Tudora*, *Adamsiella* and their allies in the *Ericiidae*, move very rapidly as compared to other land snails of similar size. They are not only rapid in their movements, but erratic; they change the direction of movement abruptly. All are very timid, and quick to contract the body within the shell when disturbed; a shadow thrown on one crawling in the sun is sufficient to cause contraction, and the animal then releases hold of the surface on which it is crawling and drops to the ground. In collecting, it is necessary to avoid startling them by a jar of the surface on which they are progressing, otherwise they instantly fall and are lost in the leaf-covered surface of the ground. This character, no doubt, is a protective one from birds and other enemies, as land crabs, mongoose, etc.

In crawling, when undisturbed, the motion is rapid; but, as noted, its direction may be changed rapidly. This rapid change of direction is possible on account of the shortness of the surface of contact of the foot and also on account of the fact that the actual surface of contact does not involve the whole foot at any time. Observations made upon *Adamsiella variabilis* (C. B. Ad.), *A. ignilabris* (C. B. Ad.), *A. irrorata* Gloyne, *Colobostylus jayanus* (C. B. Ad.), *C. jayanus rufilabris* (C. B. Ad.), *C. banksianus* (Sow.), *C. bronni* (C. B. Ad.), *Tudora armata* (C. B. Ad.), *Annularia fimbriatula* (Sow.) and *Stoastoma pisum* (C. B. Ad.) show that all the above land operculates

possess this type of movement. The method of progression of *Adamsiella irrorata* Gloyne, *Colobostylus bronni* (C. B. Ad.) and *Tudora armata* (C. B. Ad.) has been carefully studied from specimens obtained in Jamaica during the past summer (1910), and an account of their movements will apply in general to all of the above species.¹

Unlike most snails, the *entire* under surface of the foot is not applied to the surface upon which they move, but *they walk on the edges of the foot only*. The foot, when retracted into the shell, folds down the median line of the under surface; and, when protruded for walking, this same form is retained, so that ordinarily only the two outer surfaces are involved. A wave of contraction, lifting a portion of this edge of the foot, proceeds from the posterior to the anterior, the wave moving forward alternately on the two margins of the foot, and with its advance, first on the right side and then on the left, producing a swaying gait that is characteristic of the movement of all the land operculates above enumerated. The wave movement is quite independent in the two sides of the foot, and this is easily seen when the animal is examined from the under side, when crawling over a surface of glass. As the wave passes off at the anterior end of the foot on one side the succeeding wave begins at the posterior end on the other side, and thus the animal acquires the waddling or swaying gait characteristic of this type of movement. As the wave passes off anteriorly a part of the foot is lifted and moved forward; as the wave appears at the posterior end a part of the foot is lifted and moved forward also, so that seen from the front or rear especially, the animal seems to be walking upon stumpy legs, and the movement recalls that of an elephant as seen from the rear. The trail made, when moving over dry surfaces (as the animals normally have to when in their native habitat), is double, only the edges of the foot being involved, and this double trail may always be seen when these snails are actively moving about. The details of the movement in the three species that were especially examined is given below.

Colobostylus bronni (C. B. Ad.), Figure 3. This species is larger

¹ In a recent paper on the mollusca of Mandeville, Jamaica, by Pilsbry and Brown this mode of progression is briefly described as it was observed in *Colobostylus jayanus rufilabris* (C. B. Ad.) and in *Tudora armata* (C. B. Ad.). See Proc. Acad. Nat. Sci., Sept., 1910, p. 522.

than either of the other two examined, the shell measuring 16 mm. in height, with a greatest width of 12 mm. The foot is ashy-gray, the rostrum darker, the eyes black, and the tentacles a bright aurora-red. Its movements, while rapid as compared to ordinary snails, are more deliberate than those of *T. armata* or *A. irrorata*. The length of the foot when crawling is generally 9 or 10 mm.; the width varies from 5 to 4 mm., being narrower when the movement is most rapid. The waves proceed from the posterior to the anterior alternately on either side, requiring about 7 to 8 seconds for the passage of the wave the entire length of the foot, or the wave moves forward about 1.5 mm. per second. The alternate waves on the two lobes of the foot follow each other with an interval of about 5 seconds, or they are 6-7 mm. apart on the two lobes when both waves can be seen together. The rate of progression is quite rapid, varying from 2.5 to 3 mm. per wave, or 12 double waves were observed to advance the animal 70 mm., which is an average rate of progression per minute. The surface of contact of the edge of the foot involved in the movement varies from 1 mm. wide on each side with a median interspace of 2 mm., when moving on dry or dusty surfaces, to 1.5 mm. on each side with a somewhat smaller interspace, when moving on a smooth, non-absorbent surface like glass. The trail is notably double therefore, and the two parallel marks are somewhat irregular in outline.

When moving, the shell is carried balanced on the operculum, and to obtain this balance requires some care on the part of the animal, but once the shell is adjusted to the proper position the animal moves evenly, the shell swaying from side to side from the passage of the alternate waves of contraction of the foot. The balancing of the shell on the operculum was common to all of the three species examined, and undoubtedly it seems to distribute the weight more evenly on the foot, at the same time raising the shell quite clear of the surface on which the animal is moving.

As the foot of this species is large, the character of the wave movement may be readily studied. A part of the edge of the foot is raised from the surface on which the animal is moving, involving in the fold produced about 3 mm., with a clear space of 1 mm. wide, and the fold is usually 2.5 mm. high with a clear opening of more than 1 mm. This hiatus moves forward at the rate of 1.5 mm. per second, and when it reaches the anterior end of the foot this edge is thrust forward as it is raised, so that when it is applied again to the

surface it looks, as has been stated, as though the animal was progressing by steps. This appearance is very striking when the animal is viewed from in front, but when viewed from the rear the regular alternation of the apparent steps strongly recalls the movement of an elephant, as noted above. In either position, the lifting of the edge of the foot as the wave passes off, gives the animal the appearance of advancing by leisurely strides.

Tudora armata (C. B. Ad.). In this species the wave movement is similar to that in *C. bronni*, but it is somewhat more rapid, and the waves follow each other at a shorter interval; nevertheless the forward movement of the shell is slower on account of the shorter wave, being about 50-60 mm. per minute. The foot, when the animal is moving, is about 8 mm. long by 3 to 4 mm. wide; the surface of contact is about 1 mm. on each edge of the foot, with an interspace of some 1 mm. between the two sides of the foot when actively moving. The passage of the wave the entire length of the foot requires about 5 seconds; the alternate waves follow each other every 4 seconds, so that the two waves can generally be seen simultaneously if the moving animal is examined from the under side. Seen in this way the two waves of contraction are about 5 mm. apart, and the form of the foot resembles a swelled barleycorn. In crawling, the shell is balanced on the middle of the operculum, and the swaying gait is even more noticeable than in the last, from the proportionately greater length of the shell, which in this species measures: length, 15 mm.; width, 8 mm. Of course in all cases the first half of the last whorl rests on the operculum. The foot of this species is of a slaty-gray color, the tentacles and rostrum darker, and the eyes black.

Adamsiella irrorata Gloyne, Figures 1 and 2. This species is quicker in its movements than either of the others examined, but the actual distance traversed in unit time is less than in *C. bronni* or *T. armata*. The wave motion is rapid; the wave of contraction traverses the entire length of the foot from back to front in 2 seconds, and the waves follow each other every 3 seconds on each side, or there are 40 waves per minute, 20 on each side. The distance traversed in this time is about 50 mm. The shells vary in size, but the foot is about 7 mm. long when the animal is in motion; its width is about 3-4 mm. As is the case with the other species, the shell is normally carried balanced on the operculum, the round of the penultimate whorl resting in the hollow of the rather small, circular operculum. As this is so

small (3 mm. in diameter) it requires considerable adjustment to get the shell properly balanced upon it, and it usually requires several trials before the shell is finally placed in the proper balance. The animal moves forward until the body is on a strain, then the shell is hitched forward and over the operculum, on which it sometimes catches at the first trial; more often this maneuver has to be repeated several times before the shell is caught in the cup of the operculum. When the balance is finally effected the animal moves steadily away, but with the rocking gait characteristic of the group. This species is excessively timid, closing at the slightest jar, or when a shadow falls upon it, and it then drops from the surface on which it is crawling to the ground, and may lie still for several minutes before the animal is again extended. On the other hand, it is very active and quick in its movements, and liable to change its direction of motion at any point.

In this species the body is of a pale yellowish flesh color, with a darker brownish pigmented mass down the back and running into the rostrum and tentacles. The foot is the same color as the rest of the body that is protruded from the shell.

Comparing the three species upon which exact observations were made, the results may be tabulated as follows:

Comparison of motion of *C. bronnii*, *T. fecundum* and *A. irrorata*.

Species.	Waves per minute on a side.	Wave traverses length of foot, seconds.	Distance traversed in 1 minute.	Distance moved per wave.
<i>Colobostylus bronnii</i>	12	7-8	70 millimeters.	3 millimeters.
<i>Tudora fecundum</i>	15	5	50-60 "	2 "
<i>Adamsiella irrorata</i>	20	2	50 "	1.25 "

This method of progression is so different from that of most land snails that other land operculates were examined for comparison. A species of *Helicina* (*H. neritella angulata* C. B. Ad.) collected at Montego Bay, Jamaica, from which locality *C. bronnii* and *A. irrorata*

were obtained, has been examined as to its method of progression, Figure 4. It is that of the ordinary snail, the under side of the foot being in total contact with the surface over which it moves. Observed from the under side when the animal is actively crawling over a surface of glass, the foot is seen to be extended to a length of 20 mm., or, including the labial tentacles and head segment, 24 mm.; the tentacles may be protruded about 8 mm. more. The foot proper shows a central muscular portion extending its entire length, about 3 mm. wide anteriorly and tapering to less than 1 mm. wide posteriorly; it is bounded for its entire length on each side by an area that corresponds to the edge of the foot on which the above operculates move. This has apparently the structure of the upper surface of the foot and is not involved in the muscular contractions during locomotion; it does not appear to be traversed by the contractile muscles. When the under side of the foot is observed during active motion of the animal, the middle band of the foot is seen to contract in a series of waves which traverse the length of the foot in about 10 seconds, or at a rate of 2 mm. per second. These waves follow each other closely; there are about 50 to 60 waves per minute. They move from the anterior to the posterior end of the foot, in the reverse direction of the wave movement described above for the other species. The foot is not so firm as in the above species, and while the operculum is placed under the shell it does not support it, as in the case of *Colobostylus*, *Tudora* and *Adamsiella*. The motion is perfectly even, rather slow, and of course there is no swaying of the shell from side to side which is so characteristic of the other species described.

The movement of *Stoastoma pisum* (C. B. Ad.) resembles that of the above species of *Colobostylus*, *Tudora*, etc., and it has undoubtedly been observed (though not described), for Chitty gives a figure of this species crawling which shows plainly the raised margin of the foot, due to the passage of the wave. The figure is unaccompanied by any description of this character of the animal.

NOTES ON SOME LAND SNAILS FROM KENTUCKY.

BY V. STERKI.

On September 25th last I had a few hours to look for snails at Maysville, Mason Co., Ky., in the Ohio Valley. The place was the steep northeast slope of a limestone hill and on its top, for the most

part wooded and with thick underbrush and tall annuals. On the 26th Dr. Ortmann and I collected for two hours at Pleasant Valley, Nicholas Co., Ky., in the Licking Valley, on a steep, rocky south-east slope, also limestone. At both places I had no chances to look for minutiae, could do no sifting and brushing. The list of species found is naturally short, and is given below for two reasons: probably no collecting has been done there before, and there were a few interesting forms on which some notes are added. It may be noted, by the way, that all of the *Polygyræ* found were represented at Pleasant Valley—truly pleasant to the conchologist—certainly a large number found on a small spot and in a short time of hurried collecting. In the notes, M stands for Maysville and P for Pleasant Valley.

Gastrodonta ligera Say. Abundant at M, especially on a loose, old stone wall, a large form, the shells whitish in some specimens, vividly yellow towards the aperture on others. Less common at P, much smaller, the spire higher, and in most specimens dome-shaped.

Omphalina inornata Say. At P, not common.

Omphalina lævigata perlævis Pils. Shell more depressed than that of the common form and smaller; color amber, paler at the base, reddish above; with the soft parts in the shell, the latter appears somewhat olive beneath and brownish above; the radial striæ above are slighter, less sharp, subregular, and there are no revolving lines; the nucleus has the same striæ, regular, and coarser than those on the upper part of the post-embryonal shell; diam. 17, alt. (total) 11 mill.; in other exs. 15 and 9 mill.; the radula has 29 transverse rows of $m + 18(19)$ teeth, and there are no perfect admedian, as described by W. G. B. All specimens were alike except for differences in size.

Pleasant Valley, Nicholas Co., Kentucky. The snail has not the appearance of *O. lævigata*, rather that of *inornata*, for which it was mistaken at first sight; but the umbilicus is somewhat wider, and there are other differences, as noted. It agrees in the main with *O. l. perlævis*, though the color is different.

Hyalina indentata Say. One specimen at M.

Agriolimax campestris Binney. At both places.

Circinaria concava Say. Abundant at both places, larger at M.

Patula alternata Say. Common at M, large; less common and smaller at P.

Polygyra albolabris Say. A few specimens at P.

P. zuleta Binney. Not rare at P, mostly empty shells of decidedly

different forms. One specimen, a dead shell, which may be of the same, is high, globose, diam. 25, alt. 21 mill., with the last whorl considerably descending towards the aperture, and the latter quite inferior and oblique, somewhat triangular, like that of *P. elevata*, but there are only a little over six whorls, and the spire is less conical.

P. thyroides Say. Common at both places, abundant on the hill-top at M; rather large, with strong shell and lip.

P. pennsylvanica Green. A few at P, shell rather high.

P. mitchelliana Lea. One at P, found by Dr. Ortmann.

P. palliata Say. A few at P.

P. appressa Say. Common at M, mostly young; abundant at P, mostly dead shells.

P. inflecta Say. Common at P, quite small, diam. 9.5–10.5 mill.; color from light to brownish.

P. tridentata juxtidens Pils. Common at P, small, with a narrow umbilicus, strong lip and high parietal lamina; the curve between the upper and lower "teeth" of the peristome is narrow and rather angular at the periphery, and in most specimens there is an additional thin lamella extending downward and inward from the upper tooth. From its whole configuration this form appears to represent a variety.

P. fraterna Say. At both places. In some specimens the umbilicus is covered or nearly so, in others rather open, and the base around the umbilicus is rather excavated, as in *P. monodon (leai)*. The surface of all is finely and densely hirsute, and the color is light brown.

P. stenotrema Fér. Common at P. There are two forms, one of them with a large notch in the peristome, and also otherwise different, as also seen from other places; a few notes on them will follow.

Bifidaria contracta Say. One at M.

B. tappaniana Ad. One at M.

NOTES ON ORIENTAL UNIONIDÆ.

BY L. S. FRIERSON.

The following notes are offered as so many "addenda et corrigenda" to Mr. Chas. T. Simpson's great work, "The Synopsis of the Naiades:"

UNIO VESTITUS Heude.

Described by R. P. Heude in 1883 in *Conch. Fluv. Nanking*, VIII, plate lviii, fig. 112, and plate lix, fig. 116.

Mr. Simpson very properly changed the specific name *vestitus*, it having, as he remarks, been preoccupied by Lea. Mr. Simpson erred, however, in thinking that the two figures represented different species, so diverse as to be placed in different genera, i. e., fig. 112 a *Quadrula*, and fig. 116 a *Schistodesmus*. The two figures are, as Heude says, one species. Mr. Simpson's new name for fig. 112, *Quadrula ovata*, will have precedence, and the shell being properly a *Schistodesmus* will therefore be called *Schistodesmus ovatus* Simpson, and Mr. Simpson's name for fig. 116, *Schistodesmus spinosus*, becomes a synonym.

UNIO COMPRESSUS Heude.

Conch. Fluv. Nank., III, 1877, plate xxiv, fig. 52.

This specific name, being preoccupied, was changed by Mr. Simpson and called by him *Ptychorynchus incertus* Simpson, and the *Unio murinus* of Heude placed as a synonym, although the *murinus* had been published some seventeen years previously. This slip, however, was corrected in the "Errata" by Mr. Simpson by placing *murinus* as the specific name, and *incertus* Simpson becomes obsolete. But Mr. Simpson evidently overlooked the fact that this name of *compressus* had been subsequently abandoned by Heude himself, and that its natural affinities had been pointed out by Heude not once but twice. So far from being so closely allied to the *Ptychorynchus murinus* Heude, it is not even entitled to being placed in the same genus at all, but is very close to the *Nodularia douglasiae* Gray. In fact Heude in the first mention of the species (fig. 52, plate xxiv) calls attention to its kinship to the *Unio sculptus* Deshayes, which he figures on the same plate, and which figure Mr. Simpson places as a synonym of *douglasiae*. Afterwards Heude abandoned the name *compressus* and substituted the name *subpressus* (*Conch. Fluv. Nank.*, IX, 1883, pl. lxx—"Remarks opposite"), which he then places as a variety of *douglasiae* Gray.

(This whole double plate of *douglasiae* Gray and its varieties, as given by Heude, is omitted by Mr. Simpson in the references under *Unio douglasiae*, page 808, of the Synopsis.)

This shell, however, is a good species, allied to *douglasiae*, but

differs in the truncated and much split-up cardinal teeth and the broadly rounded posterior end of the shell. The *compressus* of Heude will therefore be called *Nodularia subpressa* Heude.

(To be continued.)

THE DISCHARGE OF THE GLOCHIDIA IN THE UNIONIDÆ.

BY DR. A. E. ORTMANN.

Only Lea has published a few facts which bear upon the question of how the glochidia of the *Unionidæ*, contained in the marsupium, are set free (Observ., II, x), but some of his observations are entirely wrong. Further, Simpson (Pr. U. S. Mus. 22, '00, p. 616) believes that the "ovisacs" (which I call now placentulæ) of the genus *Strophitus* are discharged through the walls of the gills, which again is wrong.

According to my observations the glochidia are discharged in the natural way in the following species: *Quadrula subrotunda* (Lea), *Quadrula undulata* (Barn.), *Pleurobema coccineum* (Conr.), *Pleurobema æsopus* (Green), *Strophitus edentulus* (Say), *Symphynota costata* (Raf.), *Anodontoidea ferussacianus* (Lea), *Anodonta imbecillis* Say.

This natural way is: they go from the water-tubes (ovisacs), inside of which they develop, into the suprabranchial canal, from this into the cloacal chamber, and thence go out of the soft parts and the shell by way of the anal opening.

In *Quadrula subrotunda*, *Pleurobema coccineum* and *æsopus*, the whole placentæ are discharged. In *Strophitus edentulus* the whole placentulæ are discharged, but sometimes the glochidia become free already in the suprabranchial canal. In the other four species named the glochidia are rather loose when discharged, and are issued in the form of irregular masses, which do not stick together, so as to preserve the shape of the placentæ.

Entirely different from these shells, which belong to the two sub-families of the *Unionidæ* and *Anodontinæ*, is the discharge in the *Lampsilinæ*. Here the glochidia do not go out by the natural channels, but break through the walls of the gills, at the edge of the marsupium, by small holes formed for this purpose, which close again after the discharge. Each ovisac (water-tube) has one hole at its distal end, and the glochidia are generally discharged in irregular masses, rather loosely connected, without preserving the shape of the

placentæ. Only in one case, *Ptychobranhus*, the placentæ are discharged whole.

Through these holes, of course, the glochidia are emptied into the branchial chamber, and from this they must go out through the branchial opening.

I have directly observed this discharge through the edge of the marsupium in the following species: *Ptychobranhus phaseolus* (Hildr.) (specimen preserved in alcohol in the act of discharging), *Lampsilis luteola* (Lam.), *Lampsilis ventricosa* (Barn.), and *Lampsilis multiradiata* (Lea) (seen in life).

I have seen evidence of this discharge, in the shape of openings at the edge of the marsupium, in alcoholic material of *Lampsilis luteola* (Lam.), *Lampsilis multiradiata* (Lea), *Lampsilis nasuta* (Say), *Proptera alata* (Say), *P. gracilis* (Barn.), and *Obovaria circulus* (Lea).

It is very likely that the peculiar morphological structure of the marsupium of the *Lampsilinæ* is directly connected with and due to this "unnatural" discharge of the glochidia, and thus we would be able to correlate the chief morphological differentiation of the *Lampsilinæ* with a physiological differentiation. In the other two subfamilies, *Unionidæ* and *Anodontinæ*, the primitive and natural way of discharge has been preserved.

But also between these latter two subfamilies we have morphological differences which are connected with physiological differentiation: the *Unionidæ* possess the more primitive structure of the marsupium, and they are all "summer breeders," or, to express the characteristic feature, are forms with a short breeding season. The glochidia are here discharged as soon as they are fully developed. In the *Anodontinæ* we observe highly complex structures of the marsupium, which apparently are correlated with the fact that they are "winter breeders," or forms with a long breeding season. Here the glochidia, after being fully developed, are not immediately discharged, but are carried through the winter, and for this purpose special structures are present which serve for the proper aeration of the marsupium during this period.

I publish these observations and conclusions chiefly with a view to induce others to test them by looking for additional cases in other species and genera.

NOTES ON CALIFORNIA SHELLS.

BY W. H. DALL.

During the past summer I visited the Pacific coast with the object of gathering data on the tertiary and recent mollusk faunas of the

Californian region, and had the good fortune to be able to inspect nearly all the collections in private or public hands, which were of importance for my studies. I propose from time to time to give the readers of the NAUTILUS the benefit of some of my notes made during the past summer.

One of the most esthetically attractive collections on the coast, containing large series of many of the rarer Californian marine shells, is that of Dr. R. H. Tremper at Ontario, Cal. These specimens are mostly from southern California, and comprise besides mollusca a fine series of the beautifully colored brachiopods of the region, *Laqueus californicus*, the attractive crimson-tinted variety (*rubescens*) of *Terebratula transversa*, the white *Terebratulina kiiensis* (also known from Japan) and the gorgeous vermilion-streaked *Terebratula obsoleta*. Attached by their peduncles to a rock brought up on a fisherman's hook from 60 fathoms off Redondo were the first and last mentioned species, with another which I did not recognize as Californian, and which proved on comparison to be the Japanese *Terebratulina crossei* Davidson, now for the first time reported from the eastern border of the north Pacific. Another shell which seemed particularly attractive, and which was new to me, was a variety of *Lottia gigantea*, which may be called *albomaculata*, offering, instead of the usual brown and grey upper surface, the feature of being spotted with rounded white maculations regularly disposed. A pretty variety (called by Mr. Hemphill var. *Tremperi*) of the fine purple-brown *Murex carpenteri* Dall is decorated with two neat white bands below the periphery. This was obtained by Dr. Tremper in 35 fathoms, off Newport, with many of the typical form.

This collection contains, among other things, a most brilliant series of the *Pecten hastatus* Sowerby in a great number of color varieties and fully the size of the northern *P. hericeus* Gould. On some of these, near the byssal notch, were seated examples of *Capulus californicus*, now for the first time reported as commensal with any species except *P. diegensis*.

I may add to this note that through the intervention of a friend I was able to purchase at Venice a specimen of *Haliotis cracherodii*, which is believed by west coast collectors to be unique. It is a perfectly normal, moderate-sized specimen, probably obtained on the coast of Los Angeles county, rather more elevated than the average, and which has not been cleaned or modified in any way. Its peculiarity consists in the fact that it has never possessed the slightest trace of a perforation, even in the youngest stages, and there is not even a suspicion of a notch at the margin. Other specimens like Hemphill's remarkable variety *holzneri* have been seen with very few perforations (Stearns records one with only two holes and a notch), but these had earlier perforations which had been closed up and were more or less abnormal in other respects. The present specimen differs from all of them in never having had any holes whatever.

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NOTES ON ORIENTAL UNIONIDÆ.

BY L. S. FRIERSON.

PSEUDODON.

This genus of shell verges on one hand into *Nodularia* and on another is close to *Virgus*. A couple of specimens of *Pseudodon resuspinatus* Martens show an outline and sculpturing very much like *Virgus*, while specimens of *Nodularia* (probably) *brandtii* from Japan show a very close kinship to *Pseudodon* in its teeth and general facies. Several specimens of *Pseudodon* having beak sculpturing show that the genus has essentially concentric and *not radial* sculpture. Hence the genus must be removed from the *Hyrianae* and placed in the *Unioninae* (page 515). One specimen has perfect beaks, and in this species, *P. resuspinatus* Martens, the sculpture consists of a double row of V's, one with the angle pointing down the posterior umbonal slope, the other down the anterior slope, and the arms coalescing in the middle of the shell thus, W. As the shell grows the angles become greater, so that on the body of the shell a roughly concentric sculpture finally results.

NODULARIA.

Considerable changes will have to be made in this genus. *Nodularia grayana* Lea, *N. japonensis* Lea, *N. involuta* Benson, *N. pazii* Lea, *N. crispata* Gould form a heterogeneous assemblage truly. The situation is but little relieved by the several sections into which the genus is cut.

Mr. Simpson himself, in letters, states that because the *N. caffer* has been found to carry eggs in the inner gill, the section "*Cafferia*"

should be removed from *Nodularia* and be placed in *Unio* next to the Unionid section *Lapidosus*. Still the situation requires heroic treatment. One or two obvious points are:

(1) *Nodularia orientalis* Lea is placed by Mr. Simpson in this genus, it is true, as he observes, with much doubt because of paucity of material. This shell, however, both by its geographical distribution as well as by its whole facies, belongs to the genus *Rectidens*.

(2) *Nodularia pazii* Lea. This shell and *ingallsiana* Lea have sandwiched between them the *Nodularia jourdyi*. Yet these species are by no means akin, the latter being a true *Nodularia*, while for the accommodation of the other two species, and probably others, a new genus should be erected.

The *Unio ingallsiana* Lea differs generically from *Nodularia* in having little or no beak sculpturing and in having a smooth shell. Its cardinal teeth are blade-like and double in the right valve and single in the left. The cardinal teeth form a part of the general inner curvature of the shell, not having a "fulcrum" (as the buttress-like thickening of the noose supporting the cardinal teeth, and extending posterior to the adductor scar, may be called), which is so generally shown in most *Unionidæ*. The "third anterior muscular scar" is separate from the anterior adductor scar, whereas in *Nodularia* they are always confluent and not easy to differentiate.

For those shells, as the *Unio pazii* Lea (and *ingallsiana* Lea), exhibiting these characters as outlined, the writer proposes the new genus **ENSIDENS**. Two other peculiarities of the two species named may prove to be of generic significance, but at present they may be regarded as being of specific import merely. These are the entire confluence of the anterior adductor and the "protractor pedis" muscle scar, and that the escutcheon is half way the length of the lateral teeth.

CIVILIZATION AND SNAILS.

BY V. STERKI.

It is known that in a general way land and fresh-water mollusks have been decreasing in numbers in consequence of deforestation and cultivation of the land, directly and indirectly by the atmosphere becoming more dry, the disappearance of springs, drying up of

creeks, at least during part of the year, which means the destruction of nearly their entire faunas, the drainage of swamps, ponds and lakes. Over large parts of Ohio, e. g., there are at present probably less than twenty, or ten, per cent. of the number of mollusks which populated them fifty or seventy years ago.

And yet it appears that the effect on certain species is rather to the contrary, and some have become common, or even abundant, at some places under changed conditions. The following are examples: *Vallonia* are not common in the forest, even rarely found there, but are more frequent in the open, among grass, etc. *V. pulchella*, *excentrica* and *costata* are common, e. g., under old bricks, boards, etc., in stone heaps, in towns and cities. *V. excentrica* is living in countless numbers in lawns which are regularly sprinkled, e. g., at Pittsburgh, collected by Mr. Geo. H. Clapp, and at Cleveland, by Mr. J. A. Allen. A single house lawn is populated by more individuals than there were on a thousand acres of original forest. In lawns at Hudson, O., *V. pulchella* and *excentrica* are common, as found by Dr. Rush, and there associated with *Vertigo pygmæa* Drap., which is decidedly rare in Ohio. *Zonitoides minusculus* is common at many places, under bricks and stones, in company with *Vallonia*, and *Bifidaria procera* Gld. I have found common in an old brickyard at Washington, D. C., and under limestone slabs at Cincinnati.

Gastrodonta ligera, generally not frequent in the woods, at least in eastern Ohio, is common and often abundant, e. g., on railway embankments, especially among dense plant growth, like *Saponaria officinalis*, and, as cited elsewhere, it was found abundant along garden walls and in thickets near houses in Kentucky. *Patula striatella* (*Pyramidula cronkhitei anthonyi*), rare in the forest, is occasionally found in large numbers under bricks, stones, old boards and garbage material, in contrast to *P. perspectiva*, which is strictly confined to the forest, and becoming rarer. *Agriolimax campestris* is now common in yards, gardens, around buildings, etc., and wherever *A. agrestis* is introduced it is found in largest numbers at just such places, while in Europe it has long been a pest to garden and field cultures. Also in Europe the largest numbers of existing *Limax maximus* L. are in cellars of houses, in greenhouses and similar places, and so it is in this country where the slug is introduced. Immense numbers of *Pupoides marginatus*, doing considerable damage to strawberries, and *Veronicella*, destructive to tomato plantations

on the Bahamas, are illustrative examples of how certain snails are thriving under favorable conditions.

One of the most notable instances of this kind is the following: *Bithynia tentaculata*, since its introduction from Europe, has rapidly gained ground and is now widely distributed and common, e. g., in Lake Erie. At the waterworks of Erie, Pa., where the intake is four or five miles out in the lake, about one mile outside of Presque Isle, the "wells at the pumping station are periodically filled up with these snails, which have to be taken out by the wagon loads. And they are also driven through the pipes over the city, and often plug up faucets." Examination showed that almost all are dead shells of *Bithynia*, with occasionally a *Planorbis* or *Physa* mixed in. The same trouble may be experienced at other waterworks along the lake, yet the first engineer of those at Cleveland told me that they had no difficulty of this kind so far.

It is well known that canals have been excellent habitats for mollusks, and richly populated, especially with *Unionida* and *Sphæriida*, and were highways of migration from drainage to drainage for many species. The more it is deplored by the conchologist that many of them have been neglected and abandoned of late years.

To come back to land snails, it may be said that in Europe a large number of them have become regular habitants of walls, yards, gardens, vineyards, orchards and fields, much more so than in most parts of North America, and in both respects more species and more individuals. In part this is no doubt due to the fact that "over there" a large part of the land has been deforested and cultivated for centuries, and the snails had all that time to accommodate themselves to changed conditions. However, it must be taken into account that most of western and middle Europe has a more or less maritime climate, with higher humidity of the air and less severe changes of temperature, than most of North America, which is more continental. At such places of the Old World, as mentioned, there are the many species of various groups of *Helix* (s. lat.), *Torquilla* and other *Pupida*, *Clausilia*, etc., most of which are out in daylight, while our *Polygyrina* and most other land snails (few of them conspicuous) are much more retiring and not, or rarely, seen during the day.

One effect of civilization and international and intercontinental trade and travel is the introduction of mollusca from one country or

continent to another, intentionally or accidentally, with plants, seeds, ballast, etc. A rather large number of species have come over from Europe to this country, and there is no doubt that the process will go on.

SHELLS FROM THE BAY OF CADIZ REGION.

BY MAXWELL SMITH.

(Concluded from p. 83.)

Cassis saburon Brug. Cassis undulata Gmel.

Morio echinophora L.

Dolium sp. Said by the fisherman to live in vast numbers in the bay.

Amphiperas spelta L. Three in drift.

Cypraea achatidea Gray. One from a fisherman. Said to have been taken here. The species I have represented in my collection from Sicily and Oran on the Algerian coast.

Cypraea pyrum. Mrs. Whishaw, several.

Trivia europea Mont. A few examples.

Erato laevis Donovan. A few fine and many dead in drift. Probably lives nearby in deep water.

Chenopus pespellicani L. Mrs. Whishaw. Small form.

Triforis perversus L. Mostly young shells.

Cerithium rupestre Risso.

Cerithium vulgatum Brug. Probably living.

Bittium reticulatum Costa. The most plentiful species taken.

Vermetus subcancellatus Biv. One, worn.

Turitella communis Risso. Several.

Littorina clathratus Phil. Littorina neritoides Phil.

Littorina punctata Gmel.

Rissoa cimex L. Some with deep brown bands.

Rissoa lactea Mich. Pure white, a beautiful species.

Rissoa ventricosa Desh. The most abundant Rissoa.

Truncatella truncatula Müll. In drift.

Paludestrina acuta Drap. Common in drift. Undoubtedly also lives near.

Calyptrea sinensis L. Mrs. W.

Natica glaucina L. Appears to be this.

Natica hebraea Martyn. A well-known species.

Natica intracatoides Hid. Several.

Sigaretus philippii Weinkauff. Mrs. Wishaw has found two or three in as many years.

Adeorbis subcarinata Mtg. Fine specimens in drift.

Scala commutata Mont. *Scala lamellosa* ? Lam. A few.

Scala pulchella Biv. One in drift.

Leiostraca sp. May prove new.

Phasianella pulex L. Seldom fresh.

Astraliu rugosum L. A large heavy shell.

Trochus lineatus Da Costa. Mrs. Wishaw. *Trochus obliquata* Gmel.

Calliostoma zizyphinum L. Mostly worn specimens.

Haliotis tuberculata L. Mrs. Wishaw. *Fissurella nubecula* L. A few.

Patella aspera Lam. Mrs. Wishaw. *Patella vulgata* L. Plentiful.

POLYPLACOPHORA.

Chiton marginatus Pennant. Living under stones resting on mud.

SCAPHOPODA.

Dentalium dentalis L. Examples vary. Some smooth.

PELECYPODA.

Ostrea angulata ? Lk. May be this.

Anomia ephippium L. Innumerable valves are constantly washed on the beach.

Lima squamosa Lam. Mrs. Wishaw. A large valve.

Pecten jacobaeus L. Mrs. Wishaw.

Pecten sulcatus Born. Around Port Saint Mary.

Pecten varius L. Lives in Atlantic as well as Mediterranean.

Avicula tarentina Lam. Not rare.

Mytilus edulis L. Sold in fish markets.

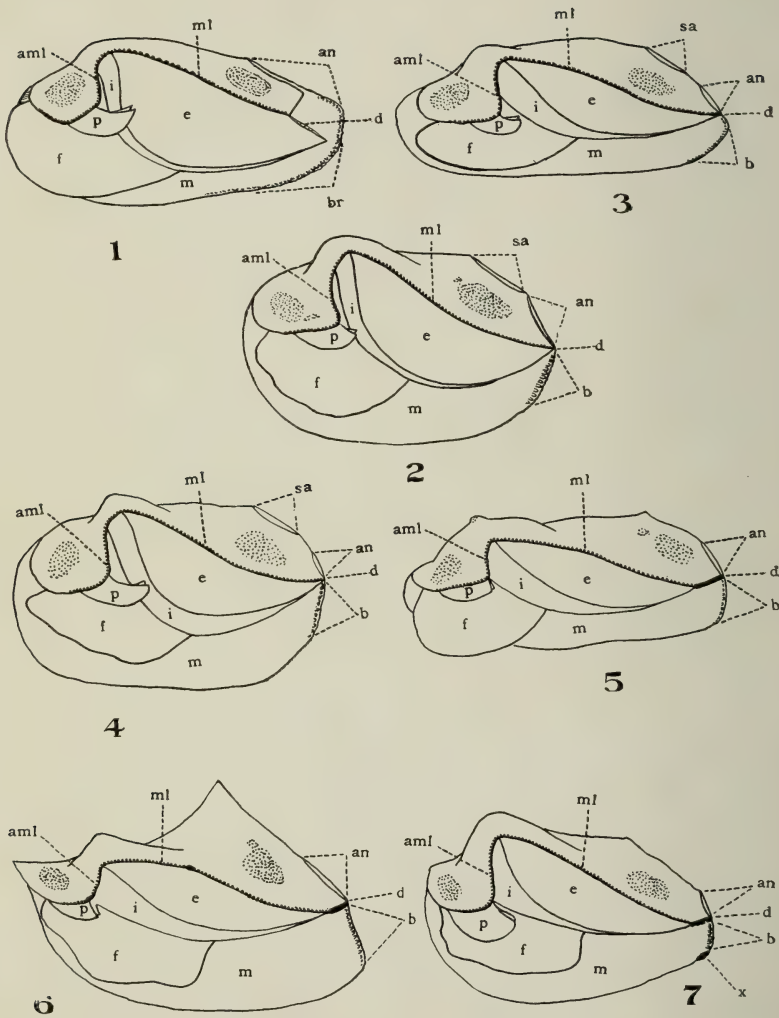
Modiola barbata Lk. *Arca barbata* L. Mrs. Wishaw.

Pectunculus gaditanus Gmel. Many valves.

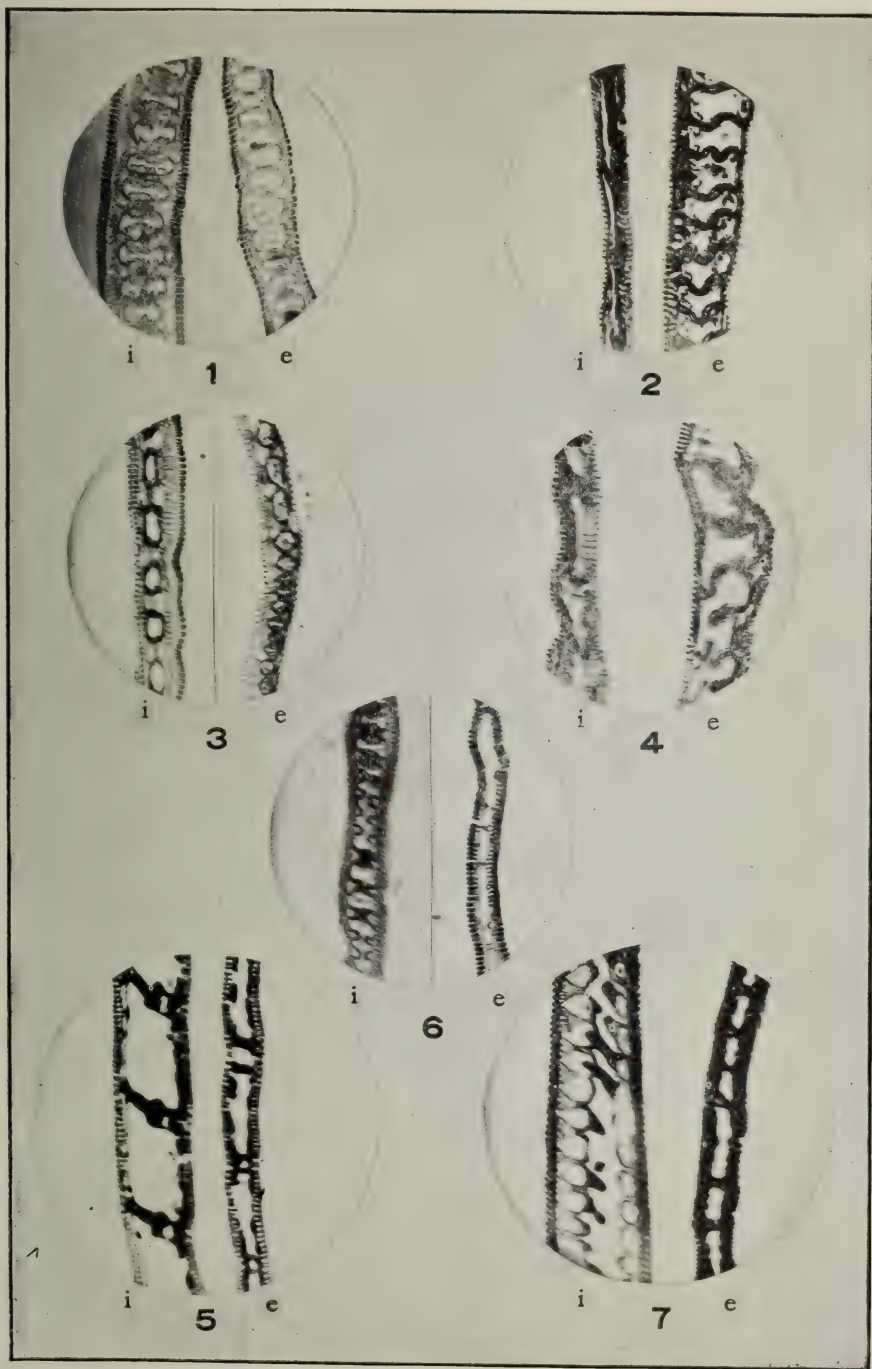
Cardita sulcata Lam. Mrs. Wishaw.

Cardium edule L. Plentiful.

Cardium edule lamarchi Reeve. Several.



ORTMANN: SOFT PARTS OF NAIADES.



Tapes decussatus L. A distinct species.

Tapes floridus Sow. Two examples.

Venerupis iris L. A Mediterranean shell.

Donax trunculus L.

Donax vittatus Lam. Smaller than the former.

Solen vagina L. *Ceratisolen legumen* L.

Mactra corallina L. Common. *Lutraria elliptica* Lk. Mrs.

Whishaw.

Pholas dactylus L. Probably will be found living.

Loripes lactea L. Single valves. *Divaricella divaricata* L.

Tellina cumana Costa. Not uncommon on mud flats.

Tellina distorta Poli. Rarely found.

Tellina planata L. One specimen.

Pandora inaequalis L. Mrs. Whishaw.

THE ANATOMICAL STRUCTURE OF CERTAIN EXOTIC NAIADES COMPARED WITH THAT OF THE NORTH AMERICAN FORMS.

BY DR. A. E. ORTMANN.

Having studied the anatomy of the soft parts of a large number of North American *Unionidæ*, I published a preliminary account of the results some time ago (NAUTILUS, Feb. 23, '10, p. 114 ff.). This had the effect that several exotic genera were submitted to me for examination, on which I have reported also (*Parreysia*, in NAUTILUS, April 23, '10, p. 139; *Spatha*, *ibid.*, August, '10, p. 39).

The peculiar facts discovered in these shells induced me to select some representative forms out of the large material of South American mussels in possession of the Carnegie Museum, and collected by Mr. J. D. Haseman, since a comparison of these with the others was much needed. A superficial examination revealed at once some very interesting features, and so I made up my mind to condense the chief results in the present paper, and to give the necessary figures to illustrate them.

Of North American types I have used for comparison the genera *Margaritana*, *Quadrula* and *Unio*. *Margaritana* stands by itself, exhibiting some quite unique features. *Quadrula* and *Unio* (together with *Rotundaria* and *Pleurobema*) are the most primitive forms among the rest of the North American *Unionidæ*, constituting my

subfamily *Unioninæ*. The other North American members of the family (*Anodontinæ* and *Lampsilinæ*) may be disregarded, since they are peculiarly developed and specialized, and have no closer relationship with the exotic forms to be discussed here. Of the latter I shall discuss the genera *Parreysia* and *Lamellidens* from Asia (India), *Spatha* from Africa, and *Hyria* and *Tetraplodon* from South America, with a few additional remarks on *Castalina*, *Diplodon*, *Glabaris*, *Fossula* and *Monocondylæa*, also from South America.

THE NORTH AMERICAN FORMS.

All North American *Unionidæ*, including *Margaritana*, differ from the African and South American types in two characters, not mentioned by me previously. These are the *anterior attachment of the inner gills* and the *shape of the palpi*. They agree in these with the Asiatic genera. The inner gill decreases perceptibly in width toward its anterior end; the latter is more or less in advance of the anterior end of the outer gill, and it is attached for a longer or shorter distance to the ascending part of the mantle-attachment line, but it is always distinctly separated from the posterior end of the palpi, generally by a considerable interval (see pl. v, figs. 1, 2, 3, 4). Possibly in *Unio* this interval is shortest; in all other forms (also in the *Anodontinæ* and *Lampsilinæ*) it occupies generally the larger portion of the ascending part of the mantle-attachment line. As regards the *shape of the palpi*, this character is not so sharply marked, but in the North American forms they are more or less falcate, with a posteriorly drawn out point. The hind margin of the two palpi may be more or less connected or almost free (compare the same figures on pl. VI).

As to all other characters we are to separate *Margaritana* from the rest of the North American forms, and I have created for it the subfamily *Margaritaninæ*. As I have pointed out in my first paper, the chief differences are found in the conformation of the anal and branchial openings, in that of the posterior end of the diaphragm, and in the finer structure of the gills. In *Margaritana margaritifera* (L.), branchial and anal opening form one large, uninterrupted opening, and there is on the mantle margin no distinct separation of them; the branchial is ill defined anteriorly, its papillæ passing rather far forward on the inner mantle edge and disappearing gradually, and there is no supraanal opening. In fact there is no ten-

gency whatever to unite the edges of the mantle at any point (see pl. VI, fig. 1). The diaphragm is unique in this genus: the outer lamina of the outer gills is posteriorly not connected with the mantle for a considerable distance, in consequence of which the posterior end of the gills (diaphragm) is drawn into a projecting, free point, forming a very incomplete diaphragm between the anal and branchial opening. And finally the gills possess the peculiar feature that they have no water tubes, that is to say the connection between the two laminae is not formed by continuous septa, but by isolated and irregularly scattered subcylindrical projections of the tissue, which sometimes are arranged in indistinct and diagonal rows.

Unio and *Quadrula*, on the contrary, show a tendency to more sharply separate branchial and anal opening, and to develop a supra-anal. The diaphragm is formed by the gills, which run backward to or close to the mantle margin, the outer laminae of the outer gills being connected with the mantle to their ends. Thus the edges of the mantle are drawn together at this point, but without growing together, which effects a sharp separation of the anal and branchial opening. Further, the anal is limited above by the coalescence of the inner mantle edges. This junction is rather short, and above it a part of the original anal is left open, the supraanal opening (the genus *Rotundaria* makes an exception, and has an anal like *Margaritana*; also in the subfamily *Lampsilinæ* we have an exception in *Lampsilis parva* (Barn.), where the anal is entirely closed above, at least sometimes). The branchial is better defined in front in these forms by the sudden disappearance of the papillæ of the inner edge.

Finally the structure of the gills is characteristic; here there are well developed water tubes, formed by septa running from base to edge of the gill, generally without any interruption.

Unio and *Quadrula* are also characterized by the marsupium (the marsupium of *Margaritana* is unknown). The water tubes (ovisacs) are narrower, and the septa are stronger and closer together than in the non-marsupial gills (see pl. VII, figs. 1 and 2). Either all four of the gills (*Quadrula*, pl. VII, fig. 1) or only the outer ones (*Unio*, pl. VII, fig. 2), in their whole length, are used as marsupium. There are no additional differentiations in the marsupial gills, the gills simply swelling during the period of gravidity, and the edges of the gills do not undergo any change (this is different in the *Anodontinæ* and *Lampsilinæ*).

The larvæ of *Unio* and *Quadrula* are glochidia of simple, semi-circular or semi-elliptical outline, with the anterior and posterior end practically undistinguishable in the shell.

ASIATIC FORMS.

Parreysia wynegungaensis (Lea) (see NAUTILUS, April, '10, pl. VI, fig. 4, and pl. VII, fig. 3) has essentially the structure of *Quadrula*. The anal and branchial openings, the diaphragm, the palpi, gills and marsupium are practically identical, as is also the general shape and insertion of the gills (the inner separated from the posterior end of the palpi). The only differences are found in the separation of the anal and supraanal, which is somewhat longer, in the attachment of the inner lamina of the inner gills to the abdominal sac, and in shell characters, chief of which is the "radial sculpture."

In addition I have investigated a species of *Lamellidens*, to which I am also indebted to the courtesy of Mr. Frierson.

Lamellidens consobrinus (Lea) from India; a sterile female is at hand. This is generally like *Parreysia* in structure, not only in those characters which agree with *Quadrula*, but also in the supra-anal, which is rather widely separated from the anal, and in the inner lamina of the inner gills, which is connected with the abdominal sac.

But there is an important exception; only the *outer gill is marsupial*, and at the posterior end of this gill *there is almost one-fourth of it of non-marsupial structure*.

The septa are of the *Quadrula* and *Unio* type, but in the marsupial part of the outer gill I observe some septa which are not complete (see pl. VII, fig. 4), i. e., they arise from either lamina without meeting in the middle of the interlaminar space; other septa are connected only by their epithelial tissue, but most of them are complete.

Possessing only a single individual, it is impossible to decide whether this is a permanent or temporary structure. It might be that the incomplete septa of the sterile female becomes complete in the gravid female.

In a general way *Lamellidens* has the same relation to *Parreysia* as *Unio* has to *Quadrula*. But it is by no means identical with *Unio*: the structure of the supraanal, the inner lamina of the inner gill and the marsupium separates it sufficiently. It remains to be seen whether the posterior part of the outer gill is always non-marsupial.

The shell of my specimen has nothing remarkable, and there is no sculpture visible near the beaks.

According to the above observations there is no question that both *Parreysia* and *Lamellidens* group with my subfamily *Unioninæ*, but that they differ generically from the North American forms. The investigation of more Asiatic types is very desirable.

AFRICAN FORM.

Spatha kamerunensis Walker. In NAUTILUS, August 24, '10, p. 39, I have given the description of the soft parts of this species. The chief differences from the North American, and also from the Asiatic, forms are the following (see pl. VI, fig. 5, and pl. VII, fig. 5):

1. The inner gill decreases very little in width in front, and is attached in its whole width to the whole length of the ascending part of the mantle-attachment line, and thus its anterior end comes in contact with the posterior end of the palpi.¹

2. The palpi are broad and short, with a very insignificant point behind, and not at all falcate; their posterior margins are not connected.

3. The anal and branchial openings are sharply separated by a bridge, formed by the firm union of the mantle edges, which extends somewhat inward, and thus

4. The diaphragm is formed posteriorly by this bridge, and not by the gills, which do not reach the posterior mantle margin.

5. The anal opening is closed above by the union of the inner mantle edges without leaving a supraanal opening.²

6. The septa of the well developed water tubes are rather remote from each other and strong.

7. In the female, the inner gills alone are used as marsupium, the septa becoming wider, but not closer set (this structure practically occupies the whole gill).

Larvæ were not found in the specimens at hand.

These differences, pre-eminently 1, 3, 4, and 7, are fundamental,

¹ The inner lamina of the inner gill is free from the abdominal sac. According to von Ihering (Zool. Anz. 14, '91, p. 479, and 15, '92, p. 2) it should be connected.

² The anal opening is continued upward, above the rectum, as a supraanal canal, which ends blindly.

and distinguish *Spatha* at a glance from the North American shells, as well as from the Asiatic *Parreysia* and *Lamellidens*, while, as we shall see by comparison with South American shells, the shape of the palpi, and the special structure of the water tubes is not so important, and while, in the development of the anal and supra-anal opening, there are differences also in the South American shells.

SOUTH AMERICAN FORMS.

The following observations are new, and so it seems advisable, to give a more complete description of the structure of the soft parts of some of these forms. I select as the first, and most important, the type-genus of the *Hyriinæ*.

Hyria corrugata Lamarck. Two specimens are at hand, both females, the one sterile, the other gravid, with eggs. They have been collected by Mr. J. D. Haseman on Dec. 10, '09, on a sand bar in Rio Tapajos, at Santarem, State of Para, Brazil. (See pl. vii, fig. 6, and pl. vi, fig. 6).

Anal opening closed above by the connection of the inner mantle edges without forming a supraanal opening, closed part about twice as long as the anal opening.¹ Anal opening a little shorter than the branchial opening, separated from the latter by the solid union of the inner mantle edges. Inner edge of anal opening almost smooth, of the branchial opening with small papillæ, which stop suddenly anteriorly, thus marking the anterior boundary of the branchial opening. In front of this the inner mantle edges are smooth and perfectly unconnected. (There is nothing like "short, contractile siphons," as Simpson states on the authority of J. E. Gray, unless it should be that the inner edge of the anal is capable of expansion.)

Palpi longer than wide, not falcate, although slightly produced posteriorly, and bluntly pointed, not connected on the posterior margin.

(To be continued.)

¹ Under the closed part extends the supraanal canal, exactly as in *Spatha*, although von Ihering asserts (Zool. Anz. 15, '92, p. 2) that in the South American *Unio* (which includes *Hyria*, etc.) there is no such canal, and that the mantle edge is affixed to the adductor muscle. The latter is impossible, since there is the rectum above the adductor.

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NOTES ON CALIFORNIA SHELLS (II).

BY WILLIAM H. DALL.

Private collections at San Diego are numerous and interesting. Those of Dr. Fred Baker, Prof. Kelsey, Miss Cooke, Mr. Gripp, Mrs. Stephens and C. R. Orcutt may be especially noted.

The Biological Station formerly at La Jolla is now removed several miles northward to escape the effects of sewage, etc., from such a rapidly-growing suburb, upon the fauna. The molluscan collections are unimportant, the energies of the staff of the station, under the supervision of Dr. Ritter, being at present chiefly devoted to problems of physical hydrology. Being the nearest United States port to Lower California and the Gulf, the collectors of San Diego have unusual opportunities for obtaining specimens from these localities through small coast traders and collectors of guano and salt.

Mr. Hemphill, so long a resident of San Diego, has removed his collection to Oakland, where it is still packed up, so there was no opportunity for studying the rich collections of this veteran field naturalist. It is to be hoped they will be acquired by one of the public institutions of California, none of which at present has a truly representative series of the California shells.

BATHYTOMA TREMPERIANA, new species?

Among the various collections studied, a form of *Bathytoma* was frequently noted which is differentiated from the *B. carpenteriana* by what seem to be very constant characters. Of these Dr. Tremper has a particularly large series. It is possible that these differences

may be sexual, but, if not, it seems that it is specifically distinct. The shell is small, in the adult stage averaging about 62 mm. in length, against 90 to 110 mm. for the fully adult *carpenteriana*. It is proportionately much heavier, the anal fasciole is more strongly constricted, and the appressed margin of the whorl does not approach as closely to the periphery of the preceding whorl as in that species. The periphery is often marked by a minutely beaded or undulate thread, and is more nearly midway between the sutures on the spire than in *carpenteriana*. The aperture is shorter than the spire in nearly every case, while the reverse is true of *carpenteriana*. The average proportions of the new form, which I propose to call *B. tremperiana*, and of *B. carpenteriana*, from measurements of 8 and 25 specimens respectively, are as follows:

B. tremperiana: aperture 32.1, spire 32.2, diam. 20.7 mm.

B. carpenteriana: aperture 34.6, spire 29.4, diam. 22.6 mm.

B. stearnsiana: aperture 26.2, spire 23.2, diam. 17.8 mm.

Dr. Tremper writes me that his examination of his series of 33 specimens of *tremperiana* confirms the above distinctions.

B. tryoniana Gabb seems (after an examination of nearly all the extant specimens) to be merely a variety of *carpenteriana*, with an unusual development of tubercles or nodes on the periphery or shoulder of the whorls.

The range of *B. carpenteriana* extends from Tomales Bay, north of San Francisco, to San Diego, in 20 to 158 fathoms, and to Cerros Island. *B. tremperiana* is known from off Santa Cruz, California, south to Cerros Island, and has been dredged living in from 29 to 822 fathoms by the U. S. S. Albatross, a remarkable bathymetric range.

MODIOLUS DIEGENSIS, new species.

In Mr. Gripp's collection, which is notable for the taste and care with which the specimens are displayed, I found a small species of *Modiolus* or *Myrina* from San Diego, which seems to be undescribed.

Shell small, zoned with dark blue, the unbones usually white, covered with an olivaceous brown periostracum; anterior end very short, rounded, with two or three radial grooves externally; unbones moderately prominent; dorsal profile ascending, nearly straight, subangulate behind, the margin carried with a broad sweep to the base where it meets the posterior end of an obscure ridge radiating

from the unbones, in front of which the valves are more or less constricted, and, on the base, flattened, giving a slightly arcuate aspect to the shell; valves with a very slight rather anterior gape; interior polished, dark blue, much as in *Mytilus edulis*, the ligament long, the anterior margin with three or four crenulations corresponding to the external radial grooves. Length 19; max. height 6.5; diameter 5.5; unbones behind the anterior end of shell 1.0 mm.

This shell recalls *Adula* of Carpenter but seems not to be a borer, and is without the peculiar fine transverse sculpture of the two Californian species of *Adula*. It may possibly be referable to the genus *Myrina*.

In Miss Cooke's collection, which is notable for the Gulf of California shells collected by the late Capt. Porter, one of the things most striking to the visitor is her fine series of polished specimens of the rare red variety of *Haliotis cracherodii*. Her best specimen, of a glowing vermilion, is resplendant. Among the specimens interesting as extending the known range, in her collection, are *Mitra belcheri* Swainson, from Magdalena Bay, Lower California; *Cymatium wiegmanni*, from the same locality; *Strombus peruvianus* from the Tres Marias Islands, and *Pachypoma inæquale* without waves and with a finer type of sculpture, from San Diego. A form of *Pachypoma*, which appears to be new, is from the Gulf of California. It is somewhat smaller than the average *inæquale*, has much the same color and sculpture, but is proportionately much higher and narrower, having much the form of '*Chlorostoma*' *brunneum*. It might be called for the present *P. inæquale* var. *spiratum*.

One of the most interesting and surprising facts is conclusively proven by material in this collection. Specimens of the "*Uvanilla*" *regina*, Stearns, with the dried animal having the operculum still attached to it, show that the species is a *Tegula*,* notwithstanding the remarkable resemblance of the shell to the true *Uvanillas* of the Gulf, which possess a heavy calcareous operculum. In the *regina* the operculum is horny and moderately multispiral. This fact had indeed been previously mentioned to me, but it was not until I saw the operculum actually attached to the animal, that I was relieved of a lingering doubt as to whether some mistake had not been made.

* More commonly called by the name *Chlorostoma*.

Another interesting shell is a specimen of *Voluta deshayesii* from Clipperton Island. The vessel which brought it was a small coaster which was sent direct to the uninhabited Clipperton Island from San Diego for a load of guano, and returned to San Diego without touching at any other point. So Miss Cooke warrantably concludes that the shell could not have been obtained elsewhere; and, as it is a rather dull and battered specimen, was not likely to have been carried there, especially as there is no trade between Clipperton Island and the Australian seas.

Miss Cooke has *Fusinus luteopictus* Dall, from the Gulf of California, and *Mitra lens* from Scammon's Lagoon at the western elbow of the Lower Californian peninsula.

Several of the collectors have found *Pteria sterna* on the San Diego breakwater, and *Melina chemnitziana* at the Coronado islands, southwest of San Diego.

Mrs. Stephens has received *Rangia lecontei* Conrad from the locality known as 'Flowing Wells' in the Colorado desert.

Dr. Baker's collection contains (from 40 fathoms off San Clemente island) *Lucina edentuloides* Verrill, *Calliostoma variegatum* Carpenter, and a *Natica* not yet identified.

A NOTE ON *ISAPIS* *OBTUSA* CPR.

BY A. W. HANHAM.

Among some local species submitted to the Rev. G. W. Taylor, of the Marine Biological Station at Departure Bay, Vancouver Island, in June of 1909, was an *Isapis* which he did not recognize at the time, but all the shells were dead specimens, having been taken under stones, at low tides, inhabited by hermit crabs. Even these had not been abundant, and the small "lot" was the catch of several seasons. The species proves to be *Isapis obtusa* Cpr., and it was kindly named for me this fall by Dr. Paul Bartsch, of the United States National Museum.

It is mentioned in Keep's "West American Shells," as is also *Isapis fenestratus* Cpr., but no particular locality is given for either. The latter species is included in the Rev. G. W. Taylor's "Preliminary Catalogue of the Marine Mollusca of the Pacific Coast of Canada," but only as a great rarity. *Isapis obtusa* Cpr. is not mentioned.

There is little about *I. obtusa* to recommend it, certainly nothing graceful or beautiful, though full-grown specimens are a fair size.

The object of this note is to record the capture this summer, by accident or by luck, of living shells. As Mr. Taylor did not know it, I judged it might be a good species, and so decided that it was worth a special search this season. My earliest "hunts" in May and June, at low tides, netted me nothing except a few more dead specimens, although I carefully searched the pools at lowest tides, the exposed rocks with their covering of sea-weeds, the haunts of hermit crabs under rocks and stones, sea kelp washed up on shore, and even the inside of any large dead shell. I had about decided that nothing but dredging would bring it to light.

Towards the end of July I joined my family in camp, under canvas, at Maple Bay, for a three weeks' holiday. This Bay is 4 or 5 miles from our home on Quamichan Lake, and is situated on the east, or inside, coast of Vancouver Island. While the bay is rather shut in, it is by no means a small one, but most of the shore is rocky, with little beach. The beach proper is but little more than a quarter of a mile in length, and the greater part is a fine shale. At one end at low tide it is quite muddy, but the other has some nice patches of clean sand, with boulders liberally distributed. It was here that I had taken the dead shells, and it was here also that I went "clam digging" to replenish our larder and add some variety to camp fare. One day after turning the clams out of the pail I found quite a sediment of sand, and a rather casual examination brought to my notice several small univalves, which on closer inspection I recognized as the shell I was hunting for, and better than that, living examples, though rather immature.

The next morning I followed the tide out to the spot where I had dug the clams, but even then I failed to find any more until I started to dig more clams, and even then it was not right away that I found them. Perseverance, however, brought reward, for presently I found one on a clam, and before very long I was taking them in ones and twos, or even little groups, in this way. Perhaps not more than one clam in twenty had the *Isapis* on them, though some spots proved rich and others barren, and this I found true when digging for them on other occasions. The *Isapis* was found only on living shells, and they were liable to turn up on those dug from extreme low tide to not very far below high-water mark, and on shells that were buried from two to six inches or more.

The clam is *Tapes staminea* Conrad, and while this was the most abundant species, other bivalves, as *Cardium nuttalli*, Conrad, and some species of *Macoma* were present in fair numbers. It was however only on the *Tapes* that any *Isapis* were found. On these they adhered quite closely, so that the digging, and even a rinse did not appear to dislodge them.

While it was seldom that I found more than two or three *Isapis* on one shell, and usually only one, in several cases, I took a *Tapes* with a whole lot of small fry massed together, perhaps as many as 20 fine shells, and others had what looked like the spawn. Their position on the *Tapes* was always close to the lips, and I think nearly always in the depression close to the beaks. Besides this species I took more rarely on the *Tapes*, a species of *Odostomia* (*Ivalea*); it also occurred on the *Cardium*. Dr. Bartsch says of it, "too young to permit of positive specific identification." This *Ivalea* may have been more abundant than I found it, being of such small size, and as I discovered very easily rubbed off. It appears to me not unlikely that *Isapis fenestrata*, may have similar habits, and that therefore, where it has been taken dead and rarely, it may prove quite as plentiful as *I. obtusa* has in this case. I should say that in our Northern waters, *obtusa* must be very local, or it would surely have been turned up "dead" long before this, by the collectors, who have done considerable collecting and dredging on our British Columbia coasts.

Included in this sending to Dr. Bartsch was *Odostomia* (*Amaura*) *talpa* Dall & Bartsch, which appears to be new to our B. C. Lists, and which species I gathered in fair numbers in this same spot, at extreme low tide, all dead and containing hermit crabs.

THE ANATOMICAL STRUCTURE OF CERTAIN EXOTIC NAIADES COMPARED WITH THAT OF THE NORTH AMERICAN FORMS.

BY DR. A. E. ORTMANN.

(Continued from p. 108.)

Gills long and narrow, the inner the wider. Edge of inner gill with the usual longitudinal furrow, which is missing on the outer gill. Outer gill gradually narrowing anteriorly, its anterior end situated at the highest point of the mantle-attachment line. Inner

gill hardly narrower anteriorly, its anterior insertion broad, occupying the whole space between the anterior end of the outer gill and the posterior end of the palpi (the ascending part of the mantle-attachment line); the inner gill is in direct continuation of and in contact with the inner palpus, in fact the base of the latter is actually connected with the inner gill for a short distance.

Outer lamina of outer gill entirely connected with the mantle; inner lamina of inner gill entirely connected with abdominal sac; posteriorly to the foot the two inner laminæ are connected with each other as usual, thus forming the diaphragm, but the four gills do not extend as far back as to the posterior mantle margin, and the posterior part of the diaphragm is formed by the union of the two mantle edges, which form a solid bridge (*d* in the figure 6 on pl. ii). The latter is 4 mm. long, while the gill part of the diaphragm is 16 mm. long (in a specimen of which the total length of the soft parts is about 82 mm.

A male not being present, the structure of the gills cannot be made out, but it very likely is identical with the structure of the outer gill in the female.

In the female the inner gill serves as marsupium, but only the inner portion of it, about one-fourth of its length at the anterior end and a little less than one-fourth at the posterior end, being non-marsupial. The swelling of the marsupium during the breeding season is not very great, and its edge remains sharp.

In the non-marsupial outer gill a development of septa and water tubes is barely indicated, in fact there are none, as compared with North American forms. There are rather slight, indistinct and distant ridges running on the inner side of the laminæ from base to edge, parallel to the direction of the filaments, but these ridges are not connected with each other across the interlamellar cavity, except at certain points by more or less cylindrical connections. The latter are more distinct and frequent and stronger near the base of the gill; they are rather scarce and slight in the middle of the gill, and again better developed toward the edge, where they sometimes are slightly elongated and like septa. But there are no continuous septa whatever, and thus the interlamellar space is not divided into water tubes.

In the marsupial part of the inner gill the connections between the two laminæ are more crowded and numerous and become more

regular, but they do not form complete septa; an arrangement into septa is indicated in so far as the connections stand in rows, but the septa remain, so to speak, perforated, the holes in them being about as long or slightly longer than the connections, and in the most central part of the gill an alternating arrangement of adjacent rows is noticed. Thus there are no distinct ovisacs, the latter forming rather a network of communicating tubes. In the non-marsupial anterior and posterior end of the inner gills the structure is similar to the outer gill. The interlamellar connections of the marsupium are rather thick, with thick epithelium, and when the marsupium is charged they stretch out considerably.

In the gravid female at hand the marsupium was filled with eggs in various stages of development, which were rather free from each other, not forming placentæ. No fully developed larvæ were seen.

The following four characters of *Hyria* are of prime importance:

1. The closing of the anal opening above without forming a supra-anal.
 2. The separation of the anal from the branchial opening by a solid bridge, formed by the union of the mantle edges (diaphragm).
 3. The contiguity of the inner gill with the inner palpus.
 4. The location of the marsupium in the inner gill alone.
- None of these characters is found in any North American shell, but all four are observed in *Spatha*. In addition, the palpi are more like *Spatha* in their general shape, although they differ somewhat.

The most important difference from *Spatha* consists of the structure of the gills, chiefly the marsupium. Septa and water tubes are very rudimentary in the non-marsupial gill, and the interrupted septa and communicating water tubes of the marsupium are quite unique. In this respect *Hyria* may be compared only with *Margaritana*, but in the latter genus the interlamellar connections are quite irregular, and do not show the slightest arrangement in rows parallel to the filaments. Although there is a certain analogy to *Margaritana* there is surely no homology.

Another important difference is the restriction of the marsupium to a part of the gill, while the complete connection of the inner lamina of the inner gill with the abdominal sac is apparently of minor value.

The conclusion is that *Hyria* undoubtedly stands nearer to *Spatha* than to any of the North American genera, and that it is as widely

remote from the so-called "*Hyriinae*" of Asia, at least from the two investigated genera, *Parreysia* and *Lamellidens*.

If *Spatha* is to be placed in a family different from the *Unionidae*, *Hyria* has to go out of the *Unionidae* also, and has to remain with *Spatha*. Yet the differences from *Spatha* are such that possibly the separation into two subfamilies would be advisable. This suggestion will be supported by the following observations:

Tetraplodon undosus (v. Mart.).¹

This species was collected by Mr. J. D. Haseman in the Rio Tiété, 25 miles above Itapura, State of São Paulo, Brazil, on "silty river banks," Sept. 27, '08. There are several lots at hand, and the one more closely investigated consists of four specimens with the soft parts, among them males and sterile females.

The structure of the soft parts of this species is essentially identical with that of *Hyria*, but I note the following differences (see pl. VI, fig. 7, and pl. VII, fig. 7):

Branchial opening closed in front by the firm union of the inner mantle edges (x in fig. 7, pl. ii). This connection is rather short, and restricted to the edge, and does not continue inward. It is easily torn by rough handling. Further in front the mantle edges are smooth and unconnected.

The palpi are rather wide and slightly produced posteriorly, with a blunt point, thus becoming almost semilunar, but not falcate; their posterior edge is connected for about one-third.

The anterior end of the inner gill is in contact with the posterior end of the inner palpus, but not connected with it.

The gill structure in the male is in both gills the same as described for the outer gill in *Hyria*. In the sterile female (pl. VII, fig. 7) it is as in the female of *Hyria*. Also here the marsupial part does not occupy the whole gill, but only a portion in the middle, leaving a larger portion free anteriorly and a smaller portion posteriorly.

Thus *Tetraplodon* is distinguished from *Hyria* not only by the shape of the shell, but also by some differences in the soft parts: the chief is the connection of the mantle edges in front of the branchial opening. Whether this is found in all species remains to be seen.

¹ I do not understand why Simpson (Pr. U. S. Mus. 22, '00, p. 866) places this species with *Castalina* v. Iher., since it is undoubtedly a *Castalia* (= *Tetraplodon*); von Ihering himself placed this species correctly.

However, it is present in *Tetraplodon ambiguus* (Sow.). I have examined a young specimen (male) from Santarem, collected by J. D. Haseman, together with *Hyria corrugata*. As far as could be made out it agrees also in the rest of the structure.

Possibly also the shape of the palpi are important for the distinction of these two genera.

Nevertheless, *Tetraplodon* agrees with *Hyria* in the essential characters of the soft parts, and it has the same affinity with the African *Spatha*, *Hyria* has, and it differs from *Spatha* in the same features as *Hyria*, namely, in the structure of the gills and the marsupium.

I may add, that I have also examined, superficially, a species of the genus *Castalina*, and several species of *Diplodon* from South America. In all these, the palpi, the attachment of the inner gill, the diaphragm, the anal opening and the location of the marsupium, are of the same type, as in *Hyria*, *Tetraplodon*, and *Spatha*, and the structure of the marsupium is like that of *Hyria* and *Tetraplodon*. The mantle edges are not connected in front of the branchial opening.¹

Thus it is clear that a number of South American *Unionidæ*, subfam. *Hyriinæ*, group with the African *Spatha*, which stands, in Simpson's system, in a different family, *Mutelidæ*, distinguished, according to Simpson, by the taxodont hinge teeth, and by the embryo, which is a *lasidium* and not a *glochidium*, as in the *Unionidæ*.

So far I have seen fully developed embryos only in a species of *Diplodon*.² Here they are *glochidia*, of peculiar shape, not almost equilateral as in the North American forms, but distinctly inequilateral, with a low anterior and a high posterior extremity, which ends in a point at the postbasal angle.³

The embryo of *Spatha* is apparently unknown, in fact, the larval form, called *lasidium*, is known only in two species of the genus *Glabaris*,⁴ and it is only by inference, on account of the supposed

¹ According to v. Ihering (Zool. Anz. 14, '91, p. 477 ff.), this connection is variable in *Castalina*, present or absent.

² Belonging to the *delodontus* group, and allied to *æthiops* (Lea) and *wagnerianus* Simps.; it is from Rio Iguassu, Parana, Brazil.

³ Much more oblique than the *glochidium* of *Diplodon peculiaris* (Lea), figured by Lea (Observ. XII, pl. 34, fig. 80).

⁴ See v. Ihering, Zool. Anz. 14, '91, pp. 480-482.

similarity of the anatomy and shell, that a *lasidium* is attributed to all *Mutelidæ*. Nevertheless, it is quite probable, that *Spatha* has also a *lasidium*, for the South American genus *Glabaris* is still more like *Spatha* in its structure, than is *Hyria* and its allied forms. I have investigated a number of specimens of *Glabaris*, *Fossula*, and *Monocondylæa*, and they all had the essential structure of *Spatha*: a firm bridge separating anal and branchial opening; the same attachment of the anterior end of the inner gill; the marsupium practically occupying the whole length of the inner gill; and the gills with well-developed water-tubes and heavy, continuous septa. The differences from *Spatha* are found in the connection of the inner lamina of the inner gills with the abdominal sac, which I consider unimportant; in the shape of the palpi, which are rather variable, but always more or less rounded and broad, not falcate; and in the anal opening, which in *Glabaris*, *Fossula*, and *Monocondylæa*, is always entirely open and closed nowhere. The most interesting fact in the three latter genera is the similarity of the structure of the water-tubes and septa of the gills to that of *Spatha*. If we may say that *Hyria*, *Tetraplodon* and *Diplodon* ought to stand in the same family with *Spatha*, we must also admit *Glabaris*, *Fossula* and *Monocondylæa*, and the latter are even more closely allied to *Spatha* than the former. Thus it would be suggested that we have here one family, possibly to be called *Mutelidæ*, which is divided chiefly by the character of the gill structure and marsupium, but also by shell characters (hinge),¹ into two subfamilies, the one (*Hyriinæ*) including at least three South American genera, the other including three South American and one African genus. For the latter possibly the name *Mutelinæ* might be used, but this depends on our knowledge of the soft parts of the type-genus *Mutela*.

The conclusions to be drawn from the present investigations are:

1. Of the Asiatic so-called *Hyriinæ* at least *Parreysia* and *Lamelidens* are to be removed, and are to be associated with the North American genera *Quadrula*, *Rotundaria*, *Pleurobema* and *Unio* in the subfamily *Unioninæ* of the family *Unionidæ*.
2. The African *Mutelid* genus *Spatha* and the South American

¹ Also the larva (lasidium) might furnish a differential character. I have seen several gravid specimens of *Glabaris*, but they had only eggs, and no fully developed larvæ.

Mutelid genera *Glabaris*, *Fossula*, *Monocondylæa*, and further, the South American *Hyriinæ*: *Hyria*, *Tetraplodon* and *Diplodon*, group together, and their differences from the North American and Asiatic forms discussed above are such that we are fully justified in placing them in a separate family, whatever the name of the latter may be.

3. Within this Afro-American family we may distinguish two types, differing in very important characters, which might properly be subfamilies (*Hyriinæ* and *Mutelinæ*).

4. The systematic affinity of African and South American genera, already pointed out by v. Ihering, is much more striking, and much better supported, than before, and it is of the most important value for zoögeographical questions, namely, for the theory of an old connection between these continents (Archhelensis theory of v. Ihering).

5. The natural system of the *Naiades* expresses a tendency of development and specialization of three chief anatomical characters, which in turn are connected with certain functions. These are: (a) the separation of the original simple branchial chamber into two chambers, branchial and suprabranchial, by the diaphragm; (b) the restriction of the branchial and anal openings of the mantle edge to defined parts of the latter, with a tendency to form siphons; (c) the development of the gills into organs for carrying the eggs and larvæ (marsupium), and the specialization and adaptation of the gill structure for this purpose.

(a) In the development of the diaphragm three types are distinguishable. The most primitive stage is represented in *Margaritana*, where the diaphragm is formed by the growing together of the inner laminæ of the inner gills of the two sides of the body, and the fusion of the outer laminæ of the outer gills with the mantle. But here the diaphragm is yet incomplete, in so far as the outer laminæ of the outer gills remain free at the posterior end, and are not connected with the mantle to its posterior margin.

(To be concluded.)

NOTES.

Dr. W. H. Dall was elected president of the American Palaeontological Society at its recent Pittsburg meeting.

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SOME NOTES ON THE OLIVIDAE—III.

BY CHARLES W. JOHNSON.

The occidental species of the genus *Oliva*, from shell characters alone, seem to divide into two groups, the one containing the larger and beautiful *O. porphyria* Linné and the smaller *splendidula* Sowb., found only on the Pacific side from Panama to Mazatlan. The other, a group of analogous species, is represented on the Pacific side by *O. spicata* Bolten, *peruviana* Lam., *incrassata* Sol., and *julietta* Ducl., and on the Atlantic side by *O. reticularis* Lam. *circinata* Mart. and *fulgurator* Bolten. It is as difficult to clearly define the species on this coast as on the other, and specimens of *O. spicata* and *reticularis* often very closely resemble each other, thus indicating a common origin.

OLIVA SPICATA (Bolten).

Porphyria spicata Bolt., Mus. Boltenianum, p. 35, 1798.

Porphyria arachnoidea Bolt., l. c. p. 36, 1798.

Oliva araneosa Lam., Ann. du Mus. XVI, p. 315, 1810.

Both Bolten and Lamarck refer to the same figure by Martini (Conch. Cab., II, tab. 48, fig. 509) and Bolten refers to it a second time under *arachnoidea*. In adopting Lamarck's names, *venulata* (p. 313) should have been the species, as it appeared before *araneosa* (p. 315). The first figure referred to by Lamarck under *venulata* is in the Encycl. Meth., pl. 361, f. 5; the second reference is to Martini (II, tab. 46, f. 488) and happens to be the figure on which Bolten based his *litterata*. It includes the oblong forms scarcely separable

from the typical *spicata*, it, however, prevents the use of Lamarck's name of *litterata*. *O. graphica* and *porcea* Mart. are only shorter and more ovate forms.

Among the variations of this species is an interesting form from San Ignacio Lagoon, Lower California, collected by Mr. Henry Hemphill. It is noticeably narrower with a much higher spire and the periphery slightly angulate, the reddish reticulations are obscured by a milky-white layer. Represented in the Ford collection by six specimens bearing the manuscript name of *hemphilli*. The variety *pindarina* Ducl. (*punctata* Marr.) is the common, slightly angulate form, quite regularly marked with dark-brown or white, obsoletely marked with light-brown, frequently entirely white, fasciole reddish. Specimens in which the markings are obscured by a dark-brown layer constitute the *fuscata* Marr.; similar specimens having the form of *graphica* are *ustulata* Lam. Brown examples of the typical *spicata* might bear the name *perfecta*. Specimens abnormally angulated at the periphery constitute the *subangulata* Phil. The variety *polpasta* Ducl. is the short broad form so densely marked as to form an olive-green ground, spotted with dark-brown, and with white triangles below the suture. The variety *cumingii* Reeve is yellow, banded or streaked with brown, it often suggests *O. peruviana* Lam.

OLIVA PERUVIANA Lamarck.

This species varies greatly in color, but lacks the finely reticulated patterns of *spicata*. The typical form is spotted; those with irregular longitudinal streaks of brown are the *fulgurata* Martens (non Ads. & Rev.). The light-colored specimens might be called *livida* and the dark-chesnut-colored form *castanea* Ford, manuscript.

OLIVA JULIETTÆ DUCLOS.

This is apparently a good species, the thickening of the outer lip suggests a closer relationship to *O. incrassata* Sol. than to *spicata*, although the young of the three species closely resemble each other.

OLIVA INCRASSATA (Solander).

Voluta incrassata Sol., Portland Cat., p. 171, 1786.

Oliva angulata Lam., Ann. du Mus., XVI, p. 310, 1810.

Solander and Lamarck both refer to the same figures by Martini (Conch. Cab., II, tab. 47, figs. 499, 500). The *O. timorea* Ducl.

probably represents a small local variety, the locality "Timor" may well be questioned. The white form is var. *nivea* Pilsbry (NAUTILUS XXIII, 132).

OLIVA RETICULARIS Lamarck.

This is almost as variable in color as its Pacific analogue *O. spicata*, but the tendency to become more or less angulate as in that species is not apparent. The typical *reticularis* is the smaller form reticulated with pink or purplish lines, common throughout the West Indies. Large cylindrical forms from the Bahamas are figured by Marrat as *nivosa*. These resemble very closely specimens of *circinata* from the Gulf coast of Florida. The *O. pallida* Marr., probably represents an immaculate form of *nivosa*, and *quersolina* Ducl. as figured by Marrat, the albinistic form of the typical *reticularis*. Specimens of *nivosa* banded and streaked with an outer layer of brown are the *formosa* Marr., + *hepatica* Marr. (*non* Lam.) + *bifasciata* Kuster.

OLIVA CIRCINATA Marrat.

Oliva litterata Lam., Ann. du Mus., XVI, p. 315, 1810. *Non* Bolten, 1798.

Oliva circinata Marr., Sowerby's Thes. Conch. IV, Oliva, p. 21, pl. 17, fig. 277, 1880.

The study of a very large series before me shows conclusively that Marrat's *circinata* is really a form of Lamarck's *litterata* and will have to replace Lamarck's name, which is preoccupied. After describing the species Marrat says: "The Brazilian representative of the West Indian *O. litterata*. It is more rounded and symmetrical and less oblique and the lip is not so spread at the posterior end." The reference to both Brazil and West Indies is very doubtful. The locality is more likely the Gulf coast of Florida as specimens from there agree with Marrat's figure. It is readily separated from *nivosa* by its different color, darker bands and fasciculations below the suture. Specimens from the east coast of Florida are usually longer and more cylindrical. A bright yellowish form is frequently found on the Gulf coast which might bear the name of *citrina*.

OLIVA FULGURATOR (Bolten).

Porphyria fulgurator Bolt., Mus. Boltenianum, p. 36, 1798.

Oliva ispida Link, Marrat, Thes. Conch., IV, *Oliva*, 12, figs. 15, 16.

Oliva fusiformis Lam., Ann. du Mus., XVI, p. 318, 1810.

Oliva obesina Ducl., Monogr., in Comp. Rendus, II, tab. 16, figs. 9-11, 1835.

Both Bolten and Lamarck again refer to the same figure by Martini (Conch. Cab. II, tab. 51, f. 562) Lamarck's first reference is to a similar figure in the Encyl. Meth., plate 367, fig. 7. The markings are coarser than in *O. reticularis*. Specimens are frequently obsoletely banded or overlaid with brown. *O. bullata* Marr., seems to be a narrow form of this species.

Since my notes appeared in the October NAUTILUS my friend Mr. Charles Hedley, of Sydney, Australia, has written that *Oliva oliva* Linné should be used in place of *Oliva vidua* Bolton. In this I now agree although at first I thought it was difficult to decide just what form should bear Linné's name. Hanley says: "Still it is not unworthy of remark that the *Oliva nigrata* of Karsten (*O. maura* of Sowerby, Genera Shells) has been indicated as the principal variety or form in the 'Museum Ulricæ' and that all cited engravings (Argenville alone excepted) of the tenth edition of the 'Systema' wherein the species originally appeared, pertain to that shell."

Mr. Hedley also calls my attention to *Oliva annulata* Gmelin (Syst. Nat., p. 3441, 1792) which I have entirely overlooked. This replaces *O. amethystina* Bolten. Both references—Lister's Conch., tab. 717, f. 1, and Martini, Conch. Cab., II, tab. 51, f. 567, refer to the white form with a revolving ridge, "testa lævi alba dorsi annulo carinato." It seems unfortunate that this pale, abnormal form should become the typical, and the beautiful normal form the variety *amethystina*.

NOTES ON CALIFORNIA SHELLS. III.

BY WILLIAM H. DALL.

In a brief resumé of notable things observed in the collections on the California coast which I was privileged to visit last summer, it is impracticable to mention all the collections visited, notwithstanding nearly every one contained something of special interest, and the courtesy and hospitality of the collectors was unfailing and

limitless. I can only faintly express once for all my feeling of appreciation to each and every one of them.

In Los Angeles and its vicinity by common consent the collection of Mr. and Mrs. T. S. Oldroyd, of Signal Hill, has no equal. For years they have been gathering the shells of the coast and sparing no pains to correctly name and attractively arrange them. They have also by exchange and otherwise gathered a fine series of exotic shells. It is hoped that this entire collection will before long find a place in the fine new fireproof building Los Angeles is erecting as a public museum. It would be a calamity if the Oldroyd shells, now in a frame building far from any means of rescue, should much longer be subjected to the risk of destruction by fire. The readers of the NAUTILUS are well aware of the large number of new species, and species new to the region which have become known through the researches of Mr. and Mrs. Oldroyd, and have been described or noticed in this journal during a long series of years.

Mr. Herbert N. Lowe, of Long Beach, has gathered an interesting collection where I noted especially large and fine specimens of the *Williamia vernalis* from San Nicolas Island, and some remarkably distorted specimens of *Neverita reclusiana*.

In the collection of Mrs. Zech, of Long Beach, I noticed a specimen of *Lottia gigantea* 105 x 85 millimeters in dimensions; a fine specimen from Monterey of the rare *Ovula vidleri* Sby. (1881) and a large suite of *O. barbarensis* Dall, both from Newport, Cal. In this as in most of the other local collections were remarkably large and fine *Acmæa scabra*, *persona* and *spectrum* from the new government breakwater at San Pedro, which is also the locality for remarkably clean and large *Omphalius aureotinctus* and *Calliostoma supragranosum*. A study of a very large number of the latter species indicates that *C. splendens* Cpr. may have to be reduced to varietal rank. Miss Zech has personally picked up on Vashon Island, Puget Sound, a specimen of *Chione fluctifraga*, doubtless carried there in ballast by some of the lumber vessels returning from the South.

In the collection of Mrs. Eshnaur at Terminal Island, was a specimen of the curious convex, fan-shaped variety *holzneri* Hemphill, of *Haliotis cracherodii*, from five miles south of Redondo, collected by Mr. Eshnaur. Most of the specimens so far obtained of this form are reported to have come from the Pacific coast of Lower Cali-

fornia. Also *Pinna oldroydi* from over 100 fathoms, off Newport, and *Capulus californicus* on *Pecten hastatus*, hitherto reported as commensal only with *P. diegensis*. Another ballast shell from Puget Sound was noted, in a specimen of *Oliva angulata*.

The collection of Hermann, later the Hettrick collection, formerly well-known to San Francisco collectors, and containing the largest known specimen of *Cancellaria cooperi*, is now the property of Mr. and Mrs. Golisch of Los Angeles. It offers many interesting Californian and exotic shells for study.

In Mrs. Ball's collection a fine and brightly colored series of *Angulus carpenteri* Dall (*variegatus* Cpr. not Gmelin) was especially notable, as well as many other attractive and interesting local species.

Mrs. Baldridge of Los Angeles, Mrs. Bentley and Mrs. McFarren of Venice, Dr. J. J. Rivers of Santa Monica and several other members of the flourishing Conchological Club of Los Angeles, have collections well worthy of examination. Mrs. Burton Williamson, whose contributions to the conchology of the coast are well-known, has given her collection to the new museum of Los Angeles where it will be suitably installed when the building is completed.

The San Francisco collectors were, without exception, the victims of the fire following the recent earthquake. Those of Oakland were more fortunate, and, notwithstanding the destruction caused at Stanford University by the earthquake, their collections were not seriously damaged. At Stanford is the large collection made at the Galapagos Islands by the expedition sent out by the California Academy. It was fortunate enough to arrive in San Francisco after the great disaster and when worked up by Mr. Ochsner, one of the expedition, will eventually take its place in the new Museum projected by the Academy, for which the city has offered a site in the Golden Gate Park, where the danger from fire will be almost nil.

Prof. Raymond of the University of California is working at the collection made near San Pedro, by the party directed by Prof. Ritter in 1899, which contains many interesting and novel forms. Among these was noticed a fine new species of *Calliostoma*, pure white in color. A specimen of *C. gloriosum* from Pt. San Pedro, 12 miles below the Cliff House at the entrance to San Francisco Bay, is in Prof. Raymond's collection. This, is I believe, the most northerly locality yet reported for the species.

Mr. Button's collection at Oakland is notable for its fine series of Cypræas, including some of the rarest Pacific coast forms of *Trivia*.

The collection of the University contains a number of Cooper's and Carpenter's types, but awaits a new building for its proper display.

THE ANATOMICAL STRUCTURE OF CERTAIN EXOTIC NAIDES COMPARED WITH THAT OF THE NORTH AMERICAN FORMS.

BY DR. A. E. ORTMAN.

(Concluded from page 120).

In all other cases the diaphragm is complete, and extends to or close to the posterior margin of the mantle, where it separates the anal from the branchial opening. Two types are recognizable, which form as many distinct and fundamentally different groups (families). In the one (*Unionidæ* of North America and Asia) the gills alone form the diaphragm. In the other (South American and African forms, possibly to be called *Mutelidæ*) the diaphragm is formed anteriorly by the gills, but posteriorly by the union of the mantle itself.

(b) The mantle edges are originally free all around. But a tendency develops soon to form two distinct openings, the siphons. In *Margaritana* the most primitive conditions are observed, and the two openings are distinguished only by the development of the papillæ. Closely allied conditions are found in a genus of typical *Unionidæ* (*Rotundaria*). But the general tendency is, among the *Unionidæ*, not only to draw the mantle edges together by the diaphragm, thus separating anal and branchial, but also to limit the anal above by the junction of the mantle edges, which, however, leaves open above the anal a supra-anal opening, which only in rare instances becomes closed (*Lampsilis parva*). The branchial opening in the *Unionidæ* is never defined anteriorly by a growing together of the mantle margins. (In the higher forms of the *Unionidæ*, subfamily *Lampsilinæ*, special structures develop in front of the branchial opening, chiefly in the female, which serve as devices for the aeration of the marsupium during the breeding season.)

In the other family (*Mutelidæ*?) the two openings are always separated from one another by a diaphragm formed by the mantle. In some cases the mantle edges are free from the rest. In other cases

the anal opening is defined above by a growing together of the mantle margins, but here a supra-anal is never formed, the fusion of the mantle edges being complete up to the upper posterior end of the two mantle halves. In addition, we find in certain forms of this group a further step in advance, which consists of the anterior demarcation of the branchial opening by a growing together of the mantle edges.

(c) The formation of the *marsupium* offers the greatest variety. It is hard to say which is to be regarded as the primitive condition, but probably originally all four gills served as receptacula for the ova, and the space between the two laminae of each gill was not differentiated and divided.

Out of this original condition more advanced structures have developed, which generally exhibit the tendency to localize the marsupium in certain gills or parts of gills, and to divide the interlamellar space into compartments (ovi-sacs and water tubes). In the different groups these purposes have been accomplished in different ways and to different degrees. In *Margaritana* the gills do not possess partitions, and, consequently, are primitive in this respect, and apparently no water-tubes and ovisacs are found. Unfortunately, the gravid female of this form is unknown to the writer.

In the more primitive *Unionidæ* (subfamily *Unioninæ*), either all four gills still serve as marsupium, and have thus preserved the original condition, or only the outer gills serve this purpose, and further, here the interlamellar space is divided by septa into rather regular compartments, running vertically to the edge of the gills, and parallel to the gill filaments. The same fundamental characters, restriction of the marsupium to the outer gills and development of water tubes and ovisacs, are found in the more highly-developed *Unionidæ* (subfamilies *Anodontinæ* and *Lampsilinæ*), but here specializations are met with, which are to be regarded primarily as adaptations to a prolonged breeding season, and to a peculiar way of discharging the glochidia.

In the Afro-South American group of *Najades* (*Mutelidæ*?), all cases so far known show the marsupium restricted to the inner gills. Two main types may be distinguished among them, according to the inner differentiation of the marsupial gill. In one case, the marsupial part of the inner gill is rather restricted (to the middle portion), and here very incomplete and intercommunicating water tubes are formed by rows of interlamellar connections; in the other case,

complete and heavy septa separate completely isolated water tubes. In none of these cases the structure of the marsupial gill is identical with that of the *Unionidæ*, although the septa and water tubes in the latter case show certain analogies to those of the *Unionidæ*. However, the finer structure being different, I consider this a case of convergency of structure.

(7) Of these anatomical differences representing functional differentiation, we may say that the oldest must be the formation of the diaphragm, for the tendency to form siphons necessarily must start with it. Almost as old as this is the differentiation of the marsupium, and thus the location of the latter and its structure must be essential. To these characters we consequently should attribute the greatest systematic value, and thus it is evident that the genus *Margaritana*, which I have placed formerly (NAUTILUS 23, Feb., '09, p. 116) in a subfamily by itself, but within the family *Unionidæ*, should rank higher, and I do not hesitate now to call it a family. Thus we would have the following three families among the *Naiades*:

Family: MARGARITANIDÆ. Diaphragm incomplete, formed only by the gills. Anterior end of inner gills distant from the palpi. Branchial and anal siphons ill defined, and not closed above, and no supra-anal developed. Gills without water tubes and with irregularly scattered interlamellar connections. Marsupium and glochidia unknown.

Family: UNIONIDÆ. Diaphragm complete, formed only by the gills. Anterior end of inner gills distant from the palpi. Branchial and anal siphons sharply separated from one another by the diaphragm. Anal very rarely not closed above, generally closed, but with a supra-anal opening (which very rarely may be obliterated). Gills with water tubes and distinct, continuous, interlamellar septa. Marsupium in all four, or only in the outer gills. Larva a glochidium. (Contains three subfamilies: *Unioninæ*, *Anodontinæ* and *Lampsilinæ*.)

Family: MUTELIDÆ.¹ Diaphragm complete, formed anteriorly by the gills, posteriorly by the mantle. Anterior end of inner gills in contact with the palpi. Branchial and anal siphons sharply separated from one another. Anal open or closed above, but there is never a supra-anal opening. Gills with very indistinct and intercommunicating water tubes or with well-developed water tubes. Marsupium only in the inner gills.

Subfamily: *Hyriinæ*. Anal closed above. Marsupium with interrupted interlamellar connections, standing in rows, and forming incomplete, communicating water tubes. Non-marsupial gill with poorly developed, scattered interlamellar connections. Larva a glochidium. (*Hyria*, *Tetraplodon*, *Diplodon*, *Castalina*.)

Subfamily: *Mutelinæ*.¹ Anal open or closed above. Marsupium with well-developed, continuous septa, forming well-defined water tubes. Non-marsupial gills also with distinct water tubes. Larva a lasidium. (*Spatha*, *Glabaris*, *Fossula*, *Monocondylæa*.)

(8) Our chief attention should now be directed to the study of further genera from Africa and Asia, and also the European forms should be more closely investigated.

EXPLANATION OF PLATES.

Plate VI.

Diagrammatic side views of the soft parts of *Naiades*, with the left half of the mantle removed along the mantle-attachment line, showing the arrangement of palpi, gills, diaphragm, anal, supraanal and branchial openings.

In all figures the letters indicate:

- m. Right half of mantle.
- ml. Mantle-attachment line.
- aml. Ascending part of mantle-attachment line.
- f. Foot.
- p. Palpi.
- i. Inner gill.
- e. Outer gill.
- sa. Supra-anal opening.
- an. Anal opening.
- b. Branchial opening.
- d. Diaphragm.
- x. Mantle connection in front of branchial opening.

Fig. 1. *Margaritana margaritifera* (L.). Specimen from Indian Run, Rene Mont, Schuylkill Co., Pa.

Fig. 2. *Quadrula subrotunda* (Lea). Specimen from Allegheny River, Kelly, Armstrong Co., Pa.

Fig. 3. *Unio gibbosus* Barn. Specimen from Little Beaver Creek, Enon Valley, Lawrence Co., Pa.

Fig. 4. *Parreysia wynegungaensis* (Lea). Specimen from Bombay, India.

Fig. 5. *Spatha kamerunensis* Walk. Specimen from Kamerun, Africa.

¹ The nomenclature depends on the knowledge of the genus *Mutela*.

Fig. 6. *Hyria corrugata* Lam. Specimen from Rio Tapajos, Santarem, Brazil.

Fig. 7. *Tetraplodon undosus* (v. Mart.). Specimen from Rio Tiété, Itapura, Brazil.

Plate VII.

Horizontal cross-sections through the gills of *Naiades*. All sections from sterile females. In all figures, i = inner gill, e = outer gill. Photographs taken with B. & L. 1-in. objective.

Fig. 1. *Quadrula pustulosa* (Lea). Specimen from Lake Erie, Cedar Point, Erie Co., O.

Fig. 2. *Unio gibbosus* Barn.

Fig. 3. *Parreysia wynegungaensis* (Lea).

Fig. 4. *Lamellidens consobrinus* (Lea).

Fig. 5. *Spatha kamerunensis* Walk.

Fig. 6. *Hyria corrugata* Lam.

Fig. 7. *Tetraplodon hasemani* nov.

(Specimens of Figs. 2, 3, 5, 6, 7 from same localities as on Plate VI; specimen of Fig. 4 from India.)

NOTES ON SOME PLIOCENE FOSSILS FROM GEORGIA WITH DESCRIPTIONS OF NEW SPECIES.

BY T. H. ALDRICH.

Some years since Prof. S. W. McCallie, State Geologist of Georgia, called my attention to a small block of soft marl in the State Museum which had a number of shells in it, and at my solicitation the same was kindly forwarded to me for examination. I found the specimens were a mixture of fresh water and marine, and that the fresh water ones seemed to be new besides being more or less distorted. The specimens were very fragile; notwithstanding the greatest care many of the most distorted were badly broken. It is hoped that a future examination will reveal more species and an assortment of forms far greater than those here described. The horizon is probably *Pliocene*, and seems to represent a southern fauna. The exact locality is four miles south of Atkinson, Wayne Co., Ga., on the Saltilla River. The list of species is as follows:

1. *Rangia cuneata* Gray. (Common, rather small.)
2. *Mulineia lateralis* Say.
3. *Mulineia congesta* Con.
4. *Dosinia* ——— sp? (Young shells.)
5. *Modiolaria* ——— sp?
6. *Gemma purpurea* H. C. Lea.
7. *Neritina* ——— sp? (Too poor for identification.)
8. *Neverita* ——— sp? (Fragments.)

New Species.

9. *POTAMIDES SALTILLENSIS* n. sp. Pl. 8, figs. 1, 1a, 1b, and 1c. Shell medium, the largest specimen about an inch in length, whorls nine. Most all the specimens being decorticated; surface marked with transverse lines which vary in intensity, also becoming nodulous near the spire, generally the younger forms are cancellated (fig. 1a). In mature specimens there are three revolving lines above; the uppermost one just below the suture, being nodulous or spinose, this line continues to the base and becomes coarsely nodulous, generally making a shoulder. The other lines are less prominent and increase to 5 or 6. Suture deeply impressed, base coarsely striated. Aperture ovate and smooth, slightly channeled above and below (fig. 1 = normal form). Length of largest specimen is 24 m.m. and breadth of body whorl 9 m.m.

REMARKS: Figure 1 = largest.

Figure 1a = young, 6 mm. in length.

Figure 1b and 1c are variations.

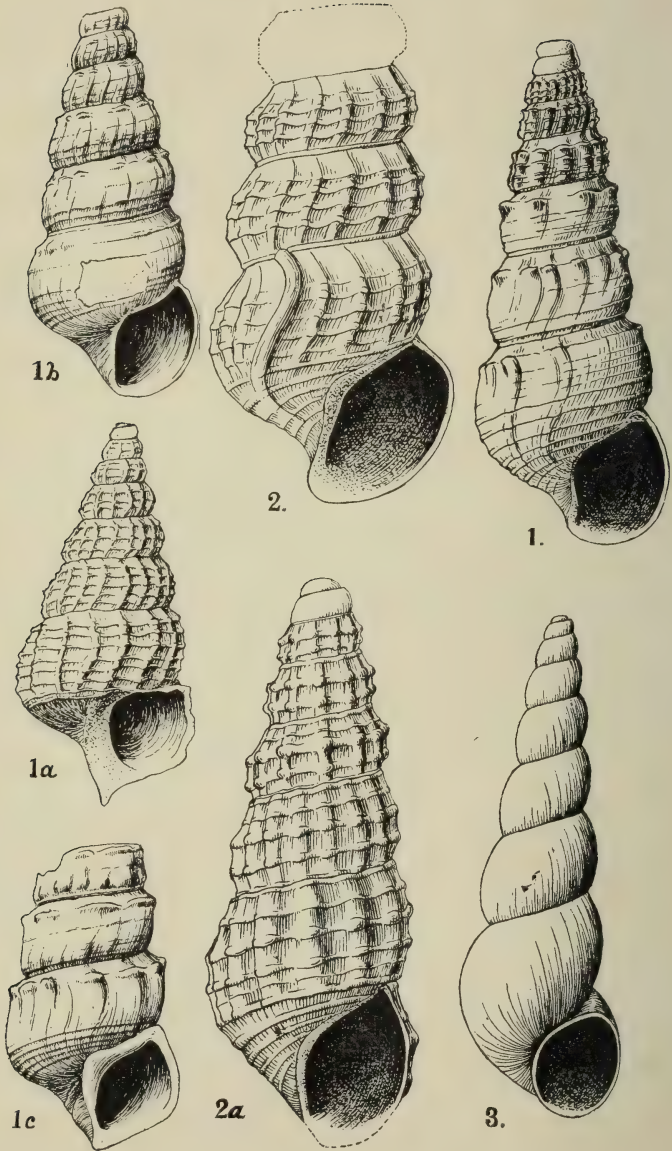
Resembles in a general way the Floridian *Goniobases*. Is related to lagoon forms of the Bahamas.

(*To be concluded.*)

NOTES.

NOTES ON *AMMONITELLA LUNATA*, CONRAD. A paper published by Conrad in the Amer. Jour. Conch. in which he described and figured two fossil shells from the John Day region in Oregon, seems to have been overlooked by more recent writers on the same subject. The one with which this paper deals was described as *Planorbis lunatus*, and was collected by the Rev. Thomas Condon at Bridge Creek, Ore. It was later redescribed and figured by Stearns as *Ammonitella yatesi praecursor*, a comparison of the descriptions and figures will leave no doubt of the two being identical. The synonymy will stand as follows: *Planorbis lunatus*, Conrad, Amer. Jour. Conch., VI, p. 315, pl. 13, fig. 8, 1871; Report of Geol. Sur. P. 448, 1883; *Gonostoma yatesi*, Cooper, Bull. 18, Geol. P. 16, 1885; *Ammonitella yatesi praecursor*, Stearns, Wash. Acad. Sci., II, p. 656, pl. 35, figs. 8-12, 1900; Science n. ser. p. 153, 1902; Bull. Geol. N. C., p. 67, 1906.

HARRY EDSON.



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COLLECTING IN MEXICO.

BY A. A. HINKLEY.

At San Dieguito, State of San Luis Potosi, February 5th, 1909, after an hour's walk to the north of town, 2 o'clock found the writer at the foot of a mountain on which a perpendicular wall of rock faces the west. It is more or less broken by openings or small ravines and shelves. Above and below the bluffs there is more or less timber, with undergrowth and creepers. From a distance it looked like a good place to find *Holospira*, *Macroceramus*, *Helicina*, *Streptostyla*, etc.

The first part of the way up the mountain was over a burned-over tract, where an occasional dead specimen of *Helicina* and *Praticolella* was to be seen, but search under loose rocks failed to disclose living specimens of either. Crossing the burned tract a heavy growth of grass was entered, through which walking was difficult. Some search was made in the grass for shells, but with no success.

When the timber was entered progress was still slower, owing to the creepers, all of which seemed to be supplied with thorns. As the bluffs were neared loose rocks became more numerous, the search here for a while producing nothing. Finally on turning a rock there lay exposed to view a single shell entirely new to me. With a thrill of delight it was picked up and examined. It was an inch and a-half long, not quite as thick as a common lead pencil, truncated at the summit, about 12 whorls remaining. Had all the whorls been present it would have exceeded two inches in length. The truncated summit, cylindric shape and color of the shell somewhat resembles *Stenogyra decollata*. Close hunting over considerable ground

resulted in finding 19 good specimens and a number of dead and broken ones, the latter looking as if some small rodent had broken them to get the animal for dinner. This shell has been named and described by Dr. Pilsbry in the NAUTILUS, Vol. 22, page 138, as *Cœlocentrum hinkleyi*. At the base of the bluffs the walking was good to what it had been below, and here are found *Macroceramus mexicanus*, *Holospira hinkleyi*, *Schasicheila hidalgoana*, *Streptostyla gracilis*, *Streptostyla supracostata*, *Helicina vanattæ* and a few dead *Euglandina corneola* and *Euglandina oblonga potosiana*; also a few specimens of a number of other species.

On the 8th of February the same bluffs were again visited. This time an early start in the morning put the writer on the ground before the sun made the climb uncomfortably warm. The entire day was put in around the bluffs and resulted in near fifty good specimens of the fine *Cœlocentrum*, but no additional species were added to the first half-day's work.

During the day a nest of small bees was encountered. This nest was made of the same material as our hornets' nests; it was trumpet-shaped, big end up, and stood at an angle from the rock to which it was attached. Being open, the bees could be seen within; they resented the presence of a stranger by buzzing about my face, but made no attempt to sting.

Standing on an elevated point of rock, which was reached after a little climb, a good view of the valley was before me. Through this valley the Mexican Central Railroad passes in nearly a straight line. The valley is cut up into small farms, occupied mostly by people from the United States who are clearing the land and planting sugar-cane, orange trees, bananas, and growing some vegetables, making homes for themselves in this mild southern country.

A COMPARISON OF THE UNIONIDÆ OF THE PEARL AND SABINE RIVERS.

BY L. S. FRIERSON.

A collection of Unios from the Pearl River, at Jackson, Miss., made by Mr. A. A. Hinkley, proves of remarkable interest, when compared with the Unios of the Sabine River, Texas; these two rivers being so far apart, and separated by the immense "bottom" of the Mississippi, which area has, in large part, a different set of inhabitants.

Pearl River.

1. Anodontoides,
2. Gracilis,
3. Cornutus,
4. Aspera,
5. Perplicata,
6. Trapezoides,
7. Heros,
8. Purpurata,
9. Confragosa,
10. Donaciformis,
11. Elegans,
12. Tuberculata,
13. Castaneus,
14. Riddellii,
15. Cerinus,
16. Concestator,
17. Inflata,
18. Excavata,
19. Claibornensis,
20. Beadleana,
21. Refulgens, }
22. Sphaerica, }
23. Ebenus,
24. Crassidens,
25. Complanata.

Sabine River.

- Anodontoides,
- Gracilis,
- Cornutus,
- Aspera,
- Perplicata.
- Trapezoides,
- Heros,
- Purpurata,
- Confragosa,
- Donaciformus,
- Elegans,
- Tuberculata,
- Castaneus,
- Riddellii,
- Cerinus,
- Nigerrimus,
- Amphichæna,
- Satur,
- Hydiana,
- Askewii,
- { Nodifera,
- { Mortonii,

Notwithstanding the absolute identity of the first fifteen species, yet there is a well-marked *tribal* difference between the two sets, the Pearl river *U. heros* being nearly full-blooded *boykiniana*, and with a *yellow nacre*.

The *U. riddellii* of Pearl river inclines towards *rubidus*, some being of a warm, rich rose color. These Pearl river shells vary also in having the successive lines of growth so heavily impressed that the shell sometimes has *humps* as well defined as in the well-known *U. dromas* Lea.

Perhaps the most interesting feature, however, lies in the list where the species differ :

U. concestator vs. *nigerrimus*. Large suites of both show their identity, with only slight differences. *U. nigerrimus* is only a variety of *concestator*.

U. excavata vs. *satur*. These two are the same species!

U. satur is not, strictly speaking, a variety of *ventricosa*, but because of priority it is a good species, and *excavata* becomes a synonym!

U. claibornensis vs. *hydiana*. The greatest difference existing here is the lack of rays in *claibornensis*.

U. beadleana,
U. chickasawensis } vs. *Askewii*. These three species are identical,

the varietal differences being no more than the different habitats should demand.

Proptera inflata vs. *amphichæna*. A suspicious piece of evidence is to be noted in the fact that where one of these species is found, there is a lack of *P. lævissima*!

However, *amphichæna* has no wing, even when young and perfect.

U. refulgens and *sphæricus*. These two species are identical and form a well-marked subspecies characterized by purple nacre.

U. ebenus and *crassidens* do not grow in the Sabine.

Margaritana complanata is by this find considerably extended down South. They were gravid when taken in November.

PLANORBIS BICARINATUS AND PLEURODONTE ANGULATA.

BY E. G. VANATTA.

Some recent studies have shown that the nomenclature of these species is somewhat intricate, and an examination into their history proves that the names in current use cannot be held.

The records bearing on the question follow.

PLANORBIS BICARINATUS Lamarck.

In the Ann. du Mus. Hist. Nat. Paris V, p. 36, 1804, Lamarck describes a fossil under the name *Planorbis bicarinata*, which was figured on plate 62, fig. 3 of the Annales du Muséum viii, 1806. It was also described in Animaux sans Vertèbres Supp., vii, p. 542, 1822. Deshayes in the Anim. s. Vert. Bassin, Paris, ii, p. 438, 1864, placed this species in *Adeorbis*.

PLANORBIS BICARINATUS Say (not Lam.)

In the Third American Edition of Nicholson's British Encyclopedia, Philadelphia, 1819, Conchology, pl. 1, f. 4, Say, described

Planorbis bicarinatus from the Delaware River. Sowerby, in *The Genera of Shells*, *Planorbis* f. 4, Mar. 30, 1822, named and figured this shell again as *Planorbis bicarinatus*. Amos Eaton in the *Zool. Text-book*, p. 194, 1826, redescribes Say's species of *Planorbis* under the generic name *Helix*, but his *Helix bicarinatus* has nothing to do with *Helix bicarinata* Sowb., *Zool. Jour.*, 1825, p. 58, pl. 3, f. 7.

HELIX ANGULATA Rackett (not Burrow.)

Helix angulata Rack., *Trans. Linn. Soc. London*, xiii, p. 42, pl. 5, f. 1 (read June 1, 1819, published before 1821), was based on specimens of *Planorbis* from Lake Huron, Canada. But this name is preoccupied by *Helix angulata* Burrow, in the *Elements of Conchology*, by Rev. E. I. Burrow, London, 1815, pl. 26, f. 1, which is *Pleurodonte acutangula* Burr. This name was also supposed to be preoccupied, but *Planorbe anguleux* Brard, *Ann. du Mus. Hist. Nat.* xiv, p. 435, pl. 27, f. 23, 24, 1809, was not Latinized by him. It is merely a French name for another shell.

PLANORBIS ANTROSUS Conrad.

Described in *American Journal of Science and Arts*, New Haven, xxv, pt. 2, p. 343, Jan. 1, 1834, from Randon's creek near Claiborne, Alabama, is therefore the first name which can be used for the freshwater shell generally known as *Planorbis bicarinatus* Say. The next name is *Planorbis engonatus* Conrad, *New Fresh Water Shells of the United States*, Appendix, p. 8, pl. ix, f. 8, Oct., 1835, based upon the same species of shell from Albany, New York. *Planorbis angistoma* Hald. *Monogr. Fresh Water Moll. U. S.*, no. 7, *Planorbis*, p. 7, Jan. 1, 1844, is according to Mr. Walker, *Nautilus*, xxiii, p. 5, probably typical *antrosus*. If this is a distinct form Conrad's name is earlier.

PLANORBIS BICARINATUS MAJOR Beck.

H. Beck in the *Index Moll.*, p. 118, 1837, lists the name *Planorbis bicarinatus* Say, and divides it into two forms: *a. major*, from the Schuylkill River and refers to Sowb. *Genera*, iv, f. 4. (Mr. E. R. Sykes in the *Proc. Mal. Soc. London*, vii, p. 194, Sept., 1906, states that part iv, of Sowb. *Genera* was published on March 30, 1822), and to Wood, *Index Test. Suppl.* vii, 12, *Planorbis angulatus* Wood.

b. minor, New Jersey, citing with a question *Planorbis eburneus* Chemn., ix, 1123? from the West Indies, as a synonym.

As Sowerby's and Wood's names both refer to the typical form of *bicarínatus* Say, as defined in Mr. Walker's excellent paper (Nautilus, xxiii p. 1. & p. 21, 1909), the name *major* Beck becomes synonymous with that form.

The form described by Mr. Walker on p. 5, of the Nautilus xxiii 1909 should be written *corrugatus* 'Curr.' Wkr.

PLEURODONTE ACUTANGULA Burrow.

Burrow's name for the shell generally known as *Pleurodonte angulata* Fér. from Porto Rico, should be used. Part of the synonymy is given below. Pfr. (Monogr. I, p. 197, 1908) thought Burrow's shell was *Helicostyla papyracea* Brod., a mistake which was perpetuated in Manual of Conchology, ix, p. 219.

Helix acutangula Rev. E. I. Burrow, Elements of Conchology, London, 1815, pp. 183 and 248. Beck. Index Moll. 1837, p. 45, No. 6, Pilsbry, Manual Conch. ix, 1894, pp. 99 and 219.

Helix angulata Burrow, Elem. of Conch. 1815, pl. 26, f. i.; Fér., Hist. Nat. Moll. I, pl. 61, f. 2, (published after 1821 and before 1825). Gray, Ann. Philos. London, n. s. ix, p. 412, 1825. Pfr., Monogr. I, p. 297, 1848. Desh. in Fér., Hist. Nat. Moll. I, p. 343, 1850.

For the rest of the synonymy see Fér., Hist. Nat. Moll. I, p. 343 and Pilsbry, Man. Conch. ix, 1894, p. 99.

Helix angulata Fér., Tabl. Syst. Anim. Moll., Prodrome Gen., 1821, p. 36, is a nude name.

NOTES ON SOME PLIOCENE FOSSILS FROM GEORGIA WITH DESCRIPTIONS OF NEW SPECIES.

BY T. H. ALDRICH.

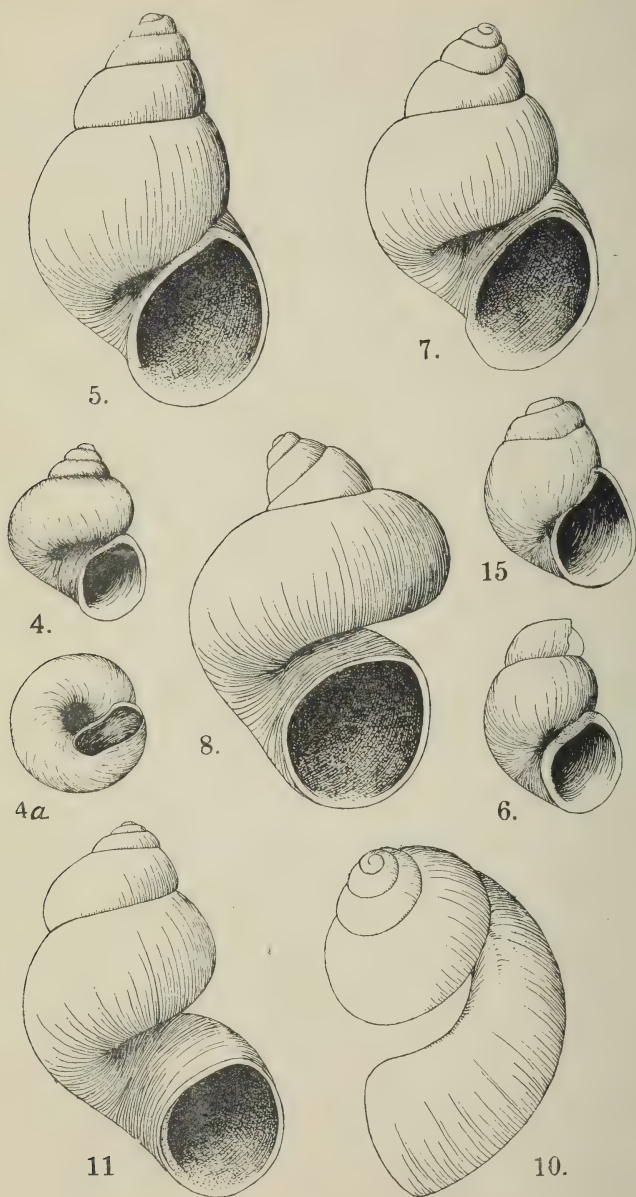
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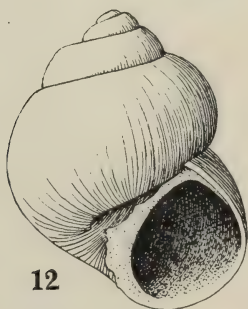
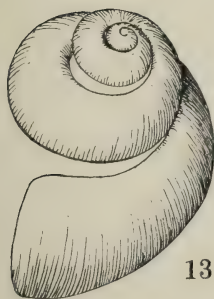
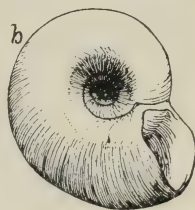
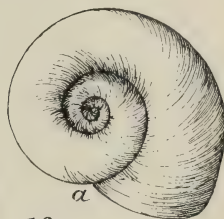
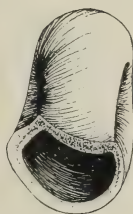
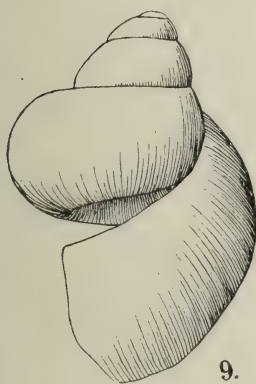
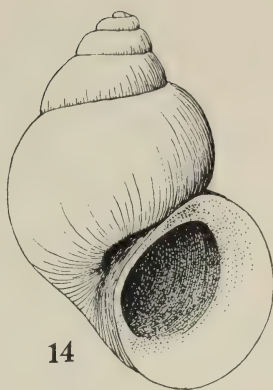
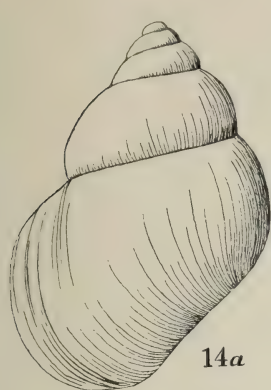
10. POTAMIDES CANCELLOIDES n. sp. Pl. 8, figs. 2, 2a.

Shell small, whorls about seven or eight, first two smooth, the next three convex and cancellated, the transverse lines strongly raised, generally two in number and nodulous at the intersections.

Body whorl in both specimens carrying four or more transverse lines. Aperture ovate-elongate; canal short twisted.

Length of No. 2a, $3\frac{1}{2}$ mm. Fully grown example is at least 15 mm.





REMARKS: This species is smaller than the one previously described. The sides more nearly parallel, the canal more twisted, and in the young we find two strong transverse lines with a flattened space between. Sometimes they are smooth otherwise and sometimes strongly marked with raised axial lines.

11. *PALUDESTRINA PLANA* n. sp. Pl. 8, fig. 3.

Shell small, acuminate; whorls seven, smooth and rounded, suture deep, aperture oblong-ovate, outer lip slightly expanded; peristome continuous; umbilicus open but minute.

Length 4 mm.

REMARKS: In some specimens the body whorl is slightly separated from the preceding ones, probably pathologic. In others the outer lip is thickened and a slight callus shows over the inner lip. A few distorted specimens with thickened shell were obtained.

12. *AMNICOLA SALTILLENSIS* n. sp. Pl. 9, 10, figs. 5-12, 15.

The extraordinary distortions of nearly all the species of this genus makes any specific determination difficult. Three species are described; perhaps there should be four. The typical form of this species is shown in figure 5.

Shell small, surface smooth, whorls five tapering regularly, suture distinct, whorls sometimes slightly shouldered. Body whorl rotund, umbilicus small, aperture pointed slightly above, rounded at base, outer lip slightly thickened.

Height 2 mm., body whorl 1 mm. in breadth. The greater number of the distorted forms are assigned to this species.

List of illustrations is as follows:

No. 5 = normal.

No. 6 = young shell (may be distinct).

No. 7 = distorted at apex with body whorl enlarged.

No. 8 = the distortion begins with the older whorls, younger part is normal.

No. 9 = a different view of No. 8.

Nos. 10 and 11 = two views of still another form.

No. 12 = both the apical and body whorls involved.

No. 15 = young shell with the apical whorls sunken in.

13. *AMNICOLA GEORGIENSIS* n. sp. Pl. 9, 10, figs. 4, 4a and 13.

Similar to the preceding, not so elevated, with wider umbilicus,

whorls five, slightly shouldered, body whorl more swollen aperture pointed and slightly expanded at junction with body whorl.

REMARKS: Shell as broad as it is high. Figure 4 and 4a is the nearest to normal obtained. In figure 13 we have all of the whorls except the apical ones entirely separated.

14. *AMNICOLA EXPANSILABRIS* n. sp. Pl. 10, figs. 14, 14a.

Shell small, whorls five and one-half, smooth, suture deep, umbilicus small, outer lip expanded and thickened.

Height 3 mm.

REMARKS: This species is the largest of all and is distinguished by its form and thickened outer lip. Strongly resembles a species of *Pachydrobia*, yet it may also be a pathologic freak. The above three species seem to be distinct, the variations and deformations may all be forms of one species. More material is necessary to decide. They certainly form an interesting study for the evolutionist.

Is it environment and food or salt and saltation?

15. *PLANORBIS ANTIQUITUS* n. sp. Pl. 10, figs. 16, 16a and 16b.

Shell small, whorls four, rather flattened above, suture moderate. Lines of growth coarser and rougher as they approach the aperture. The younger shell shows numerous very fine growth lines, umbilicus deep with straight sides, aperture flattened ovate, outer lip somewhat expanded and slightly thickened within. The peristome thin, but continuous in old specimens. The umbilicus shows more of the whorls than the upper surface.

REMARKS: This form belongs to the *Planorbis bicarinatus* group and is quite distinct.

NOTES ON COLLECTING SPHAERIUM AND PISIDIUM.

BY JOHN A. ALLEN.

In collecting *Sphaerium* and *Pisidium* I have obtained the shells most copiously and with the least amount of labor and eye-strain by the process described below. In Ohio the cold water and soft bottom make rubber wading-boots necessary. The collecting tool is a scoop of wire netting sold as a kitchen utensil under the name "strainer." The larger sizes, which are most efficient, usually need some improvement by cutting off projections or strengthening with solder.

The strainer is provided with a short handle. If a long handle happens to be required, the strainer can be temporarily fastened on a stick by winding around with a cord. Scrape off a slice of the bottom mud with the strainer, bring the rim above the water-surface, and swirl around. Mud and sand wash out, and a mixture of trash and shells remains. The strainer is now most easily emptied by passing it through water contained in a wash-basin. A dish-pan, if it is practicable to carry such a bulky utensil, is still better, because it will float beside the collector when working away from shore. If one is without any basin, the contents of the strainer are knocked or shaken upon a cloth.

The total product is usually carried home for treatment and put in a coarse sieve, which fits into a dish-pan or light steel kettle full of water. My sieve is made by nailing wire netting of one-fourth-inch mesh on a wooden frame. The mixture is worked with the fingers until the bivalves have passed out of the sieve into the dish. The sieve is now removed with its contents of sticks and leaves. These are looked over before being thrown away, as they often contain *Physa*, also may include very large *Sphæria*, such as *S. simile*, too big to pass through the sieve. Now one stirs up the water with the fingers and pours it off cautiously, puts in more water, and repeats the process as many times as required. The trash is thus washed away and a residue is obtained, consisting mainly of shells. If stones are present, a proper motion of the dish will now bring them to the opposite side from the shells, so that they can be removed. Then any conspicuous pieces of trash yet remaining are removed by hand-picking. Now, if any fine sand is present, the shells are brought into a strainer of finer mesh than the collecting strainer and washed free from it. The shells are now put in alcohol. Sometimes the use of the coarse sieve can be omitted, because little or no trash coarse enough to be retained by it is present. After one to three days the shells are taken from the alcohol and spread out to dry. If they are left too long in the alcohol there is danger of the valves opening.

The final purification can be deferred until winter, if wished. The shells are poured upon a sheet of paper in portions of about a half teaspoonful at a time, and a camel's-hair brush is used to push shells one way and dirt another. Before doing this it is often useful to remove the finest dirt, and then divide the shells into two or more sizes by a series of strainers or sieves of different mesh.

The minuter species of *Amnicola* may sometimes be collected by a process similar to that given above; except that for these one does not plough up the bottom, but strikes the strainer over the bottom or through the weeds. A mixture of species is usually obtained, which may be advantageously sorted with a reading glass.

NOTES ON FOSSIL CALIFORNIAN PLEUROTOMIDÆ.*

BY IRA M. BUELL.

The very large collection of fossil forms of this group, made in the Pliocene of Santa Monica, California, by Dr. Rivers, formerly Curator of the Museum of the State University, has afforded the writer opportunity to institute interesting comparisons between forms previously classified under several subgenera of this group. The collection contains over one thousand specimens of these forms, hence the means to test the value of specific distinctions were far more perfect than were apparently present when the species were first described.

Subgenus BORSONIA.

Distinguished by plication on columella.

1. *Borsonia hooveri* Arn. Of 27 specimens examined, 16 have faint to obsolete columellar plication. One shows three faint ridges, while the rest lack the subgeneric distinction entirely. All agree in outline and number of whorls with Arnold's type, but about half have almost obsolete nodes on apical whorl like *D. renaudi* Arn., which this approaches.

2. *Borsonia bartschi* Arn. Of 70 specimens studied, 20 show plications faint to obsolete in most individuals, one has three, and one has two faint ridges on columella. About half have transverse ribs on the body whorl, and the rest are marked like *D. renaudi*,

* The Rivers Collection of above 100,000 specimens of fossil Californian Mollusca now becomes the property of Beloit College, Beloit, Wisconsin, and Pomona College, Claremont, California, half going to each of these institutions. Numerous important comparative studies have been made while the entire collection is still intact. This great collection indicates one thing with great certainty and that is that the work on the San Pedro and Santa Monica fossil Mollusca will have to be entirely recast. An examination of the material in *Fusus*, *Natica*, and other genera, indicate a condition similar to that described above for certain Pleurotomidæ.

but with fewer whorls. The specimen named by Raymond does not show plication.

3. *Borsonia dalli* Arn. Only four specimens are found under this label. Two show no plication, and the others, though plicate, have one and three more whorls than the type. In this case Arnold's figure does not agree with the description.

4. *Drillia merriami* Arn. Of ten specimens all agree with the author's figure and description in surface markings. Six have the form of *B. bartschii* but differ in the transverse ribs on the body whorl, and one has a plication on the columella. Four slender forms agree with the type, but one has nine whorls and two have plications like *Borsonia*.

5. *Drillia renaudi* Arn. Of 27 specimens examined, 10 agree in form and surface markings with *B. bartschii*. One has columellar fold almost obsolete, 20 agree with the type in the absence of ribs on the body whorl, but have from one to three fewer whorls, while 8 have faint plications on the inner lip.

6. *Drillia pedroana* Arn. Of 20 specimens examined, two broken ones agree with Arnold's figure and description, but the others have from one to three more whorls. Half of these have a distinct sutural band, while the rest approach the next.

7. *Spirotropis smithi* Arn. Of 150 specimens examined, 10 agree in form and surface markings with *D. pedroana* as above noted in the perfect forms. Several have faint spiral lines on the body whorl like the last. One half exceed the type in size, approaching 50 mm.

8. *Pleurotoma perversa* Gabb. About 600 individuals were brought together under this name in the Rivers Collection, and simply because they happened to be sinistral forms. About half are very robust, approaching 60 mm. in length, with broader, more ventricose whorls than the figure and description, but among these are a few which duplicate the dextral *S. smithi*. The smaller forms noted as "young" in the collection are more slender with flattened volutions, and absolutely duplicate, in sinistral form, the dextral types of *D. pedroana*, *B. dalli*, and *B. hooveri*.

These notes lead to rather interesting conclusions:

1. The predominating type in these beds is the sinistral. All of the smooth dextral forms, *B. dalli*, *D. pedroana*, and *S. smithi*, have exact counterparts with reversed coil.

2. This duplication of dextral and sinistral forms minimizes the value of reversal of coil as a specific distinction in this group.

3. The intergradation of supposed specific distinctions in the case of all these described species points to a most chaotic condition in the group, and suggests the need of a reclassification of the group based on broader knowledge and far more extensive material.

NOTES.

MIDWAY-PERNAMBUCO FAUNA:—On several occasions I have called attention to the fact that Dr. White's "Cretaceous" fauna published in the *Archivos do Museu Nacional do Rio de Janeiro*, vol. vii, is a mixture of Midway Eocene and true Cretaceous forms (See *Bull. Am. Pal.* vol. i, p. 154–157.) Especially have I maintained that the Maria Farinha beds are Eocene. That in eastern Brazil there may be both Cretaceous and Eocene, alike in lithologic appearance and general attitude may well be allowed. But owing to the profound hiatus in our Southern States between the two terranes (though lithologically sometimes similar and formerly supposed to intergrade, *Bull.* 43, U. S. G. S.) there seemed good reason for supposing that the east Brazilian fossils represent two distinct horizons whose remains had not been carefully discriminated or labeled in the field.

In looking over a box of fossils carefully labeled as to exact horizon from eastern Venezuela a few days ago, I found the typical Midway fauna with the Maria Farinha representatives without the slightest indication of any Cretaceous forms.

The point therefore which I wish to make is this, that, if the Midway as far south as Venezuela shows no trace of Cretaceous forms, it is fair to presume that even somewhat farther south in Brazil the Midway and Cretaceous are still entirely distinct.

Again, this shows quite clearly too that, as we had often maintained, the Midwayan is a tropical, or warm-water fauna, though occurring as far north as west Tennessee.

G. D. HARRIS.

BERMUDA SHELLS. By E. G. Vanatta (*Proc. A. N. S.*, Phila., 1910). Recent specimens of *Kaliella turbinata*, *Vertigo numellata* and *marki*, and *Carychium bermudense* are recorded. These forms were described as fossils in the aeolian limestone. A fresh-water fauna was formerly supposed not to exist in Bermuda, but the following new species are now described and figured. *Physa caliban*, *Planorbis uliginosus*, *P. imus*, *Ancylus bermudensis*, *Pisidium volutabundum* and *Paludestrina bermudensis*. Mr. Vanatta also found fresh-water diatoms. Several other species new to Bermuda are recorded.





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